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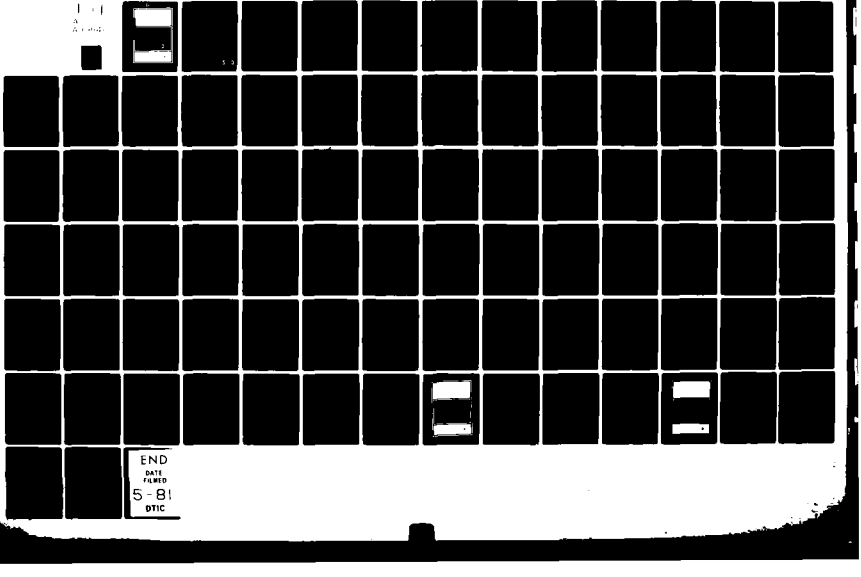

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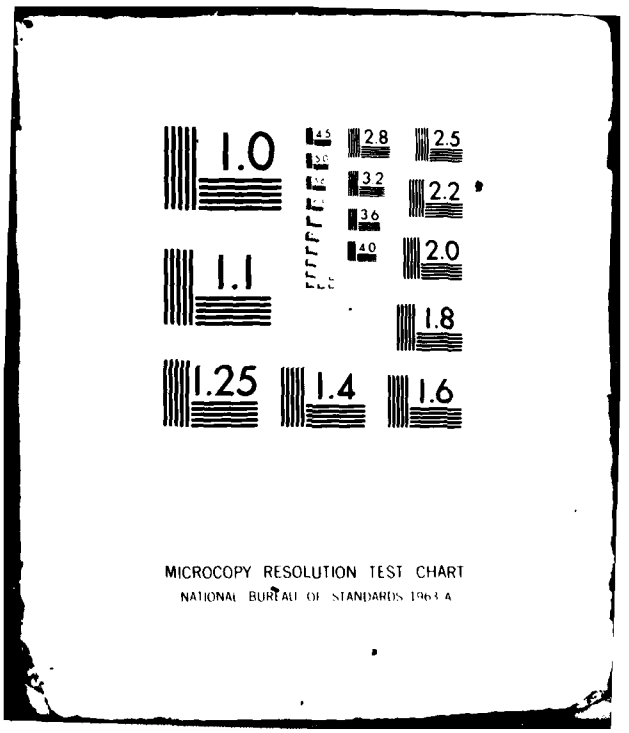
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CONTENTS

THE MISSION OF AGARD

The mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

- Exchanging of scientific and technical information;
- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;
- Improving the co-operation among member nations in aerospace research and development;
- Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;
- Providing assistance to member nations for the purpose of increasing their scientific and technical potential;
- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

The highest authority within AGARD is the National Delegates Board consisting of officially appointed senior representatives from each member nation. The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Programme and the Aerospace Applications Studies Programme. The results of AGARD work are reported to the member nations and the NATO Authorities through the AGARD series of publications of which this is one.

Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations.

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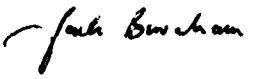
PREFACE

AGARD accomplishes its mission through the programs of the Panels, the Consultant and Exchange Division and the Military Committee Studies Division. The Panel programs of AGARD are conducted at meetings which are organized as conferences, symposia, specialists meetings, or working group meetings, and planned at business meetings. The Consultant and Exchange Division organizes Lecture Series and Short Courses as well as providing individual consultants to the nations and AGARD Panels. The Military Committee Studies Division organizes and participates in Technology Studies conducted by the Panels and special Aerospace Applications Studies; both types of studies are requested by or through the North Atlantic Military Committee.

This AGARD Bulletin contains information on all the planned 1981 AGARD meetings including dates, locations and brief descriptions of their themes. Additional specific information will be provided by means of individual Meeting Announcements which will be distributed by the various Panels. Queries about participation in AGARD meetings can be addressed to the appropriate Panel Members or National Delegates whose names and addresses are listed in Section III of this Bulletin.

Included in this Bulletin is also a list of all AGARD publications which were issued in 1980, together with their abstracts. Complete listings of all AGARD Publications which appeared since the founding of this agency are included in the AGARD Index of Publications. Information on how AGARD documents may be obtained is given on the back cover of this Bulletin.



Jack Burnham
Director

SECTION I

1981 AGARD TECHNICAL MEETINGS

- CALENDAR OF AGARD MEETINGS 1981
- SUMMARY OF 1981 MEETING THEMES

Attendance at AGARD Panel Meetings and Lecture Series is by invitation only and is normally limited to citizens of the NATO Nations. Applications should be made to an AGARD National Delegate or Panel Member from the applicant's own country. Citizens of the Federal Republic of Germany or of the United States of America must apply respectively through the appropriate German or US Panel Coordinator. Citizens of the Italian Republic and The Netherlands must apply through the Italian National Delegate's Office and The Netherlands National Coordinator, respectively. The names and addresses of National Delegates, National Coordinators, and Panel Members will be found in Section III of this Bulletin.

CALENDAR OF MEETINGS
1981

Dates	*Location*	*Activity*	*Type of Meeting/Subject*
2–5 March	UNITED STATES (NASA-Ames, Moffett Field)	Fluid Dynamics	Lecture Series No.114 **Dynamic Stability Parameters**
16–19 March	BELGIUM (VKI, Brussels)	Fluid Dynamics	Lecture Series No.114 **Dynamic Stability Parameters**
25–27 March	FRANCE (Paris)	Headquarters	**50th National Delegates Board Meeting** **30th Panel Chairmen's Meeting** **11th National Coordinators' Meeting** **30th Steering Committee Meeting**
30 March–3 April	NETHERLANDS (Soesterberg)	Aerospace Medical	Specialists' Meeting on **Aural Communication in Aviation**
5–10 April	TURKEY (Çeşme)	Structures & Materials	52nd Panel Meeting/Specialists' Meeting on **Aircraft Corrosion and Corrosion Fatigue**
6–10 April	UNITED STATES (Monterey, Cal.)	Electromagnetic Wave Propagation	Symposium on **Special Topics in Optical Propagation** (NATO-Secret)
6–10 April	FRANCE (Paris)	Flight Mechanics	58th Panel Meeting/Symposium on **The Impact of Military Applications on Rotorcraft and V/STOL Aircraft Design** (NATO-Secret)
2–3 April	UNITED KINGDOM (London)	Propulsion & Energetics	Lecture Series No.113 **Microcomputer Applications in Power and Propulsion Systems**
6–7 April	GERMANY (Munich)	Propulsion & Energetics	Lecture Series No.113 **Microcomputer Applications in Power and Propulsion Systems**
9–10 April	ITALY (Genoa)	Propulsion & Energetics	Lecture Series No.113 **Microcomputer Applications in Power and Propulsion Systems**
4–8 May	GERMANY (Stuttgart)	Guidance & Control	32nd Panel Meeting/Symposium on **The Impact of New Guidance and Control Systems on Military Aircraft Cockpit Design** (NATO-Confidential)
11–15 May 18–20 May	UNITED KINGDON (London)	Military Committee Studies	AAS 13 & 14 Meetings 20th Meeting of the AASC – **Final Review of AAS 13** – **Initial Review of AAS 14** – **Final Terms of Reference for AAS 15 & 16** – **Organization of Study Group 15** (NATO-Secret)
11–15 May	FRANCE (Toulouse)	Fluid Dynamics	48th Panel Meeting/Symposium on **Aerodynamics of Power Plant Installation** (with participation of PEP)
11–15 May	FRANCE (Toulouse)	Propulsion & Energetics	57th Panel Meeting/Specialists' Meeting on **Helicopter Propulsion Systems**
22–23 June	FRANCE (Paris)	Aerospace Medical	Lecture Series No.115 **Personal Visual Aids for Aircrew**
25–26 June	GERMANY (Fürstenfeldbruck)	Aerospace Medical	Lecture Series No.115 **Personal Visual Aids for Aircrew**
22–26 June	NORWAY (Røros)	Avionics	41st Panel Meeting/Symposium on **Tactical Airborne Distributed Computing and Networks**
31 August–1 September	NORWAY (Bölkesjo)	Avionics	Lecture Series No.116 **Electromagnetic Compatibility**
3–4 September	GERMANY (Munich)	Avionics	Lecture Series No.116 **Electromagnetic Compatibility**

Dates	*Location*	*Activity*	*Type of Meeting/Subject*
7–8 September	ITALY (Rome)	Avionics	Lecture Series No.116 **Electromagnetic Compatibility**
7–11 September	GERMANY (Munich)	Technical Information	34th Panel Meeting/Specialists' Meeting on **What Should Users Expect from Information Storage and Retrieval Systems of the 1980's?**
16–18 September	UNITED KINGDOM (Oxford)	Headquarters	51st National Delegates Board Meeting 17th Annual Meeting 31st Panel Chairmen Meeting
21–25 September	BELGIUM (Brussels)	Electromagnetic Wave Propagation	28th Panel Meeting/Symposium on **Medium, Long and Very Long Wave Propagation (at frequencies less than 3000 kHz)**
27 September–2 October	NETHERLANDS (Noordwijkerhout)	Structures & Materials	53rd Panel Meeting/Specialists' Meeting on **Maintenance in Service of High Temperature Parts and Dynamic Environmental Qualification Techniques**
1–2 October	NORWAY (Bölkesjo)	Guidance & Control	Lecture Series No.117 **Multivariable Analysis and Design Techniques**
5–6 October	NETHERLANDS (Delft)	Guidance & Control	Lecture Series No.117 **Multivariable Analysis and Design Techniques**
8–9 October	TURKEY (Ankara)	Guidance & Control	Lecture Series No.117 **Multivariable Analysis and Design Techniques**
5–8 October	GERMANY (Fürstenfeldbruck)	Aerospace Medical	38th Panel Business Meeting
5–9 October	ITALY (Florence)	Flight Mechanics	59th Panel Meeting/Symposium on **Combat Aircraft Manoeuvrability** (NATO-Confidential or Secret)
12–16 October	GREECE (Athens, Agios Andreas)	Guidance & Control	33rd Panel Meeting/Symposium on **Guidance and Control Technology for Highly Integrated Systems** (NATO-Confidential)
19–23 October	GREECE (Athens, Agios Andreas)	Avionics	42nd Panel Meeting/Symposium on **Impact of Advanced Avionics Technology on Ground Attack Weapon Systems** (NATO-Secret)
19–20 October	DENMARK (Copenhagen)	Structures & Materials	Lecture Series No.118 **Fatigue Testing Methodology**
22–23 October	PORTUGAL (Lisbon)	Structures & Materials	Lecture Series No.118 **Fatigue Testing Methodology**
26–27 October	GREECE (Athens)	Structures & Materials	Lecture Series No.118 **Fatigue Testing Methodology**
26–30 October	UNITED KINGDOM (London)	Propulsion & Energetics	58th Panel Meeting/Symposium on **Ramjets and Ramrockets for Military Application** (NATO-Confidential)
2–6 November	PORTUGAL (Lisbon)	Fluid Dynamics	49th Panel Meeting/Symposium on **Fluid Dynamics of Jets with Applications to V/STOL**
9–13 November 16–18 November	UNITED STATES (Washington D.C.)	Military Committee Studies	AAS 14 & 15 Meetings 21st Meeting of the AASC – **Final Review of AAS 14** – **Initial Review of AAS 15** – **Consideration of Proposed AA Studies** – **Organization of Study Group 16** (NATO-Secret)

SPECIAL COURSES

11–22 May	NETHERLANDS (Delft)	Flight Mechanics	**Flight Test Instrumentation Course**
7–11 Dec	BELGIUM (VKI, Brussels)	Fluid Dynamics/ Structures & Materials	**Modern Data Analysis Techniques in Noise and Vibration Problems with Particular Emphasis on Aeroacoustic Applications**

SUMMARY OF 1981 MEETING THEMES

AEROSPACE MEDICAL PANEL

Specialists' Meeting: **Aural Communication in Aviation**
30 March–3 April 1981, Soesterberg, Netherlands

With the need for pilots of high-performance aircraft to perceive and respond to audio warnings instantly and with the minimum of effort, the quality of airborne voice communications systems has to be improved.

The aim of the meeting is to cover the entire field of speech communication in flight, from the characteristics of speech to ideal systems designed for its transmission and reception. Sessions will also be devoted to discussing the cost of inefficient systems in terms of damage to hearing and reduced operational capability, hearing conservation, and speech intelligibility tests.

38th Panel Business Meeting
5–8 October 1981, Fürstenfeldbruck, Germany

Invited speakers will present to Panel Members "Recent Advances in Aerospace Medicine".

AVIONICS PANEL

41st Panel Meeting/Symposium: **Tactical Airborne Distributed Computing and Networks**
22–26 June 1981, Røros, Norway

With the growing emphasis and resulting major trend to distributed computing and computer netting, it is very appropriate and timely for AVP to hold a symposium on airborne applications of this technology. The advent of modern digital micro-electronics, digital micro-computing devices, recent agreements on standardizations of internal bus communications, structures and developments in the area of secure high-rate external data links had indicated the practical capability for implementation and utilisation of airborne distributed and network systems. This symposium will bring out for discussion and review the various technologies and methodologies under current development or consideration.

42nd Panel Meeting/Symposium: **Impact of Advanced Avionics Technology on Ground Attack Weapon Systems** (Classified)
19–23 October 1981, Athens, Greece

New technology including new electromagnetic and electro-optic sensors, high density data and signal processors, digital exchanges and advanced man-machine interfaces as well as new components and materials will allow for concepts of new smaller and cheaper tactical fighters with all weather, day-and-night capabilities. This Symposium will review technology advances and the enhanced capabilities which they will provide for countering armor attacks as well as providing air support and interdiction capabilities under all conditions.

ELECTROMAGNETIC WAVE PROPAGATION PANEL

30th Panel Meeting/Symposium: **Special Topics in Optical Propagation** (Classified)
6–10 April, 1981, Monterey, California, USA

This Symposium will address such diverse topics as: optical transmission in the marine boundary layer for tactical communications at sea, pulse-stretching due to scatter of high-power blue-green laser propagation between satellites and submarines, theory of radiative light transfer across the ocean surface, and high-altitude propagation effects including earth limb radiance fluctuation in the infrared and effects of earth background on early warning sensors.

31st Panel Meeting/Symposium: **Medium, Long and Very-Long Wave Propagation (at Frequencies less than 3000 kHz)**
21–25 September, 1981, Brussels, Belgium

Use of these frequency bands has remained relatively constant despite some of their disadvantages. Much new propagation information has been obtained, principally at ELF and VLF frequencies, since the last AGARD Symposium on this topic. New techniques have not been applied below 3000 kHz. This Symposium will summarize the current state of knowledge in this frequency band in areas of propagation, antennas and radio communications technology; present recently acquired data and knowledge; and speculate on trends and future use of these bands.

FLIGHT MECHANICS PANEL

58th Panel Meeting/Symposium: **The Impact of Military Applications on Rotorcraft and V/STOL Aircraft Design** (Classified)
6–10 April 1981, Paris, France

This Symposium is intended to bring together both technologists and users in the field of V/STOL and rotorcraft. Jet-lift V/STOL aircraft are now operational with four nations, and the role of rotorcraft in the battlefield arena may be assuming a greater importance. It appears timely to review the technological position in the light of operational possibilities and needs. The meeting will be classified NATO Secret.

Topics to be addressed will include:

- Lessons from operational experience (mission effectiveness compared to conventional aircraft; use under adverse weather conditions; availability/maintainability in the field; etc.).
- Status of technology (particular projects; application of composite materials; new control technology; etc.).
- Technological deficiencies (why are the Harrier and helicopters the only operational VTOL; is the helicopter the only viable answer to sustained hover mission requirements; what are the problems in subsystems and in system integration).
- Military mission effectiveness (trade-offs between VTOL and CTOL; what are the missions specifically demanding VTOL; considerations of quick reaction time; base vulnerability).

An expanded Round Table Discussion is planned, to permit maximum debate amongst advocates and critics, designers and users.

59th Panel Meeting/Symposium: **Combat Aircraft Manoeuvrability** (Classified)
5–9 October 1981, Florence, Italy

Current and recent technology developments have opened up a range of possibilities for major improvements in manoeuvrability of combat aircraft in the air-air and air-ground modes. There are now real prospects of exploiting a whole new regime of controlled flight, at angles of attack well beyond the normal stall limit, given the availability of automatic departure/spin prevention systems. There is, in addition, a range of new and not-so-new concepts capable of changing the traditional modes of control, of which thrust vectoring and direct lift and side-force generation are examples. All these concepts can be seen as improving combat manoeuvrability to some degree, but there is no simple way of assessing their usefulness, in terms of combat success rate, at the design stage. Most have reached the flight test stage, and a good deal of information must exist, at least in qualitative form, of their effect on combat manoeuvrability. A review of the situation is therefore planned, with the broad aim of relating technical possibilities to operational requirements. The meeting will be classified NATO-Confidential.

The main areas to be considered are:

- Operational requirements (desirable improvements in manoeuvrability; influence on tactics; relation to agility of weapons; etc.).
- Prospects for improvements in manoeuvrability (spin-resistant configurations; improved high angle of attack aerodynamics; new control degrees of freedom; control usage for departure prevention).
- Prediction methods of aircraft performance and manoeuvrability (state of the art and need for new methods or facilities).
- Assessment methods (combat simulation in computers, piloted simulators or flight; flight test techniques and instrumentation).

FLUID DYNAMICS PANEL

48th Panel Meeting/Symposium: **Aerodynamics of Power Plant Installation**
11–14 May 1981, Toulouse, France

Powerplant installations involve complex flows, strongly influenced by viscous effects and often with important aerodynamic interactions between the airframe and propulsion system. The introduction of new vehicle propulsion concepts, and new points of emphasis in aircraft and missile design requirements, provide an expanding range of aerodynamic problems which call for both experimental and theoretical study. It is the purpose of the symposium to survey the current and foreseeable aerodynamic problems in powerplant installation and to review recent work which has improved basic understanding or has enhanced prediction and design methods in this field.

49th Panel Meeting/Symposium: **Fluid Dynamics of Jets with Applications to V/STOL**
2–5 November 1981, Lisbon, Portugal

A number of major current aeronautical developments highlight the need for improvements in our understanding of the fluid dynamics of jets and the fundamentals of mixing. The most important of these developments are V/STOL aircraft and the associated use of thrust vectoring. In addition, there are other engineering applications of jets that call for a better understanding of their fluid dynamics.

The main areas of interest are: Jet mixing with and external flow to which it is inclined, effects of jets on the aerodynamic properties of neighbouring surfaces, interaction of multiple jets, wind tunnel simulation and ground plane effects, effects of nozzle geometry and initial conditions including highly curved ducts, ejectors, injectors and thrust augmentors, theoretical models and their assessment against experimental results.

GUIDANCE AND CONTROL PANEL

32nd Panel Meeting/Symposium: **The Impact of New Guidance and Control Systems on Military Aircraft Cockpit Design** (Classified)
4–8 May 1981, Stuttgart, Germany

In recent years, the role of the pilot, particularly in single-crew aircraft, has changed dramatically. The advances in flight control, weapon aiming systems, navigation and communication systems coupled with ECM and many other capabilities have presented a real challenge to the Aircraft System Designer and in particular to the design of a cockpit layout with controls and displays that maximize the overall aircraft capability while keeping the pilot's workload within bounds. The air-to-air and air-to-ground attack missions are becoming very demanding and the range of munitions, from free-fall bombs and guns to agile guided weapons, presents system integration problems which also reflect into cockpit design.

The meeting will consist of five sessions: Overview requirements/technology, Displays, Controls/displays system integration, Automated systems/man-interface, Cockpit systems evaluation. It will be concluded by a round table discussion on the question: Are cockpit technology advances meeting operational requirements for military aircraft?

33rd Panel Meeting/Symposium: **Guidance and Control Technology for Highly-Integrated Systems** (Classified)
12–16 October, Athens (Agios Andreas), Greece

The highly integrated guidance and control system can be the key to high performance, economic and reliable systems. To attain high reliability conventional design employs large independent subsystems. This technique for several reasons cannot be treated as a practical design for the future. Several recent Guidance and Control Panel activities treating the impact of digital techniques have shown there is a rapid emergence of digital processor applications to guidance and control. These offer integration opportunities heretofore unavailable in analogue systems. Therefore, it was felt timely to organise a meeting assessing the impact of wholly integrated system concepts on the system elements and/or subsystems.

The meeting will consist of eight sessions: Operational requirements, Major operational evaluations, Cooperative system design considerations, Autonomous integrated weapons systems, Threat and target detection and identification, Affordability and survivability considerations, Panel discussions on affordability and survivability considerations.

PROPULSION AND ENERGETICS PANEL

57th Panel Meeting/Specialists' Meeting: **Helicopter Propulsion Systems**
11–15 May 1981, Toulouse, France

This meeting will be aimed at highlighting progress in propulsion systems of rotary-wing aircraft and will provide a forecast of technological developments for future applications. Many of today's successful helicopters are the result of continuous attention to propulsion systems, but a large share of the effort still is based on reaction to the operational environment of fielded units. As such, development activity has produced many lessons that now can be applied early in the design process. In particular, it will be valuable to review this history and survey the events that have led to today's status. In addition, factors to be addressed include: inlet protection from the dusty and sandy unprepared landing sites; component technology peculiar to engines, transmissions and drive trains; life-inhibiting environments; dynamic compatibility of the propulsion and airframe subsystems; and the impact of emerging technologies on future helicopters. This meeting will bring together those individuals who have made significant contributions to the field and will be held in parallel with a Fluid Dynamics Panel Symposium on 'Aerodynamics of Powerplant Installations'.

58th Panel Meeting/Symposium: **Ramjets and Ramrockets for Military Applications** (Classified)
26–30 October 1981, London, UK

With this Symposium the Panel turns its efforts especially to supersonic missile propulsion systems of highly military interest. The aim of the meeting will be to provide a forum for discussions to research scientists and development engineers and to furnish a comprehensive survey on modern ramjet and ramrocket technology and their possibilities in missile propulsion to application experts in government and military staffs.

Beginning with the military requirements and the requirements deducted by engine specific performance, the complete propulsion systems will be discussed including engine integration, dual mode engines, variable geometry engines, booster integration and boost phase transition. The aerodynamics of inlet diffusors and engine interactions will be emphasized. A lot of problems to be discussed are concerned with combustor and combustion, solid and liquid propellants, metal loaded propellants, slurries, hydrogen and fuel management. Testing methods, materials and manufacturing techniques will be further topics of the Symposium.

STRUCTURES AND MATERIALS PANEL

52nd Panel Meeting/Specialists' Meetings: **Aircraft Corrosion. Corrosion Fatigue**
5–10 April 1981, Çeşme, Turkey

Aircraft corrosion is a very expensive phenomenon in terms of cost, inspection, maintenance and repair manpower requirements, or decreased aircraft availability. This Meeting responds to the perception that improved communication between the corrosion R & D, the design and engineering, and the operating and maintenance communities should be helpful in anti-corrosion efforts. Presentations are scheduled from each of these communities and, together with scheduled discussion, are intended to improve the inter-community communication.

In the Corrosion Fatigue Meeting, three principal topics will be addressed:

- Results will be presented of an AGARD-sponsored corrosion fatigue cooperative testing programme involving several laboratories, on both sides of the Atlantic, working to a carefully prepared and mutually agreed set of rules. An assessment will be made of the effectiveness of sharing between different laboratories an investigation of a size prohibitive for its execution at a single laboratory. At the same time, readily applicable information will be given on the performance of current protection schemes for aerospace aluminium alloys.
- Plans will be developed and discussed for a supplemental programme of a considerably wider scope, both as to the parameters to be investigated and to the conditions of testing.
- In addition, papers will be presented stimulating thought on fundamentals of corrosion fatigue on the one hand, and of its combat for real structures on the other.

53rd Panel Meeting/Specialists' Meetings: **Dynamic Environment Qualification Techniques. Maintenance in Service of High Temperature Parts**
27 September–2 October 1981, Noordwijkerhout, Netherlands

The first Meeting will review the state-of-the-art of dynamic qualification techniques and test methods for military aircraft with external stores, including consideration of the rationale and interpretation of existing standards. The determination of environmental inputs from various sources and their application to specific aircraft and store configurations, including helicopters, will be covered. Presentations will also be given on the development of vibration analysis techniques and the evaluation of possible improvements in prediction methods and establishment of criteria.

The Meeting on Maintenance in Service of High-Temperature Parts will examine, on a broad front, the interrelationship between materials science and technology, and maintenance problems, with a view to combatting the increasing cost of maintenance of engines by increasing the utilization of components. The areas to be covered will include protective schemes, monitoring of ageing, rejuvenation of materials, repair schemes and criteria to be adopted for component retirement.

TECHNICAL INFORMATION PANEL

34th Panel Meeting/Specialists' Meeting: **What Should Users Expect from Information Storage and Retrieval Systems of the 1980's?**
9–10 September 1981, Munich, Federal Republic of Germany

The Panel, following meetings in 1979 and 1980 which dealt with relatively basic aspects of aerospace and defence information work, but which nevertheless were directly responsive to the needs and interests of the NATO countries which hosted the meetings, is now anxious to look ahead to the nature and likely effects of new information practices, equipment, etc. To this end, for their 1981 Specialists' Meeting, in the Federal Republic of Germany, the Panel plans first to make a retrospective judgement of significant developments which have occurred in the field during the last two decades and, in particular, review problems which have not yet been solved, such as automatic indexing, fact retrieval, and input standardization.

The Meeting will then consider the context of the 1980s, in terms of relevant technical and social changes which can be expected, and try to assess what will be the impact of these changes upon the information services available in the late 80s. Topics of special interest to be addressed include the interfaces between technical information services, technical libraries, and on-line services and important fundamental technological questions such as the relative roles of mini-computers, microprocessors, and large centralized processors. The effect of the imposition of service charges upon information and library services will also be considered. The programme will conclude with a user-supplier dialogue in the form of a Forum Discussion.

LECTURE SERIES

Lecture Series No.113: **Microcomputer Applications in Power and Propulsion Systems** (with the Propulsion and Energetics Panel)
2– 3 April 1981, London, UK
6– 7 April 1981, Munich, Germany
9–10 April 1981, Genoa, Italy

The objective of the Lectures will be to familiarize the participants with microprocessor technology, design methods, and current applications in the aeronautical power and propulsion field. Topics proposed include: microprocessor characteristics by manufacturer, memory characteristics, software HI and LO level language tradeoffs, sensor and actuator interfacing, control logic design methods, redundancy managements, and a description of several current applications to engine control.

The Lecture Series Director will chair a round-table discussion at the end of the presentations during which comments and suggestions will be invited from participants.

Lecture Series Director: Prof. D.Powell, Dept of Aeronautics and Astronautics, Stanford University, Palo Alto, California, USA.

Lecture Series No.114: **Dynamic Stability Parameters** (with the Fluid Dynamics Panel)
2– 5 March 1981, NASA Ames, Moffett Field, USA
16–19 March 1981, VKI, Brussels, Belgium

The proposed Lecture Series will review the impact of high-alpha aerodynamics on the dynamic stability characteristics of aircraft and missiles. A state-of-the-art survey of analytical, wind-tunnel and flight test techniques will be presented. Lectures will include the following topics:

- Basic concepts.
  Impact of high-alpha aerodynamics on dynamic stability parameters.
- Forced oscillation, rotary, snaking, curved, rolling flow, and half-model techniques in wind-tunnel testing.
  Determination of dynamic stability parameters from flight testing.
  Analytical determination of dynamic stability parameters.
- Control derivatives and aircraft motion sensitivity.
- Applications to aircraft and missiles dynamics.

Lecture Series Director: Dr K.J.Orlick-Rückemann, National Aeronautical Establishment, National Research Council, Montreal Road, Ottawa, Ontario K1A OR6, Canada.

Lecture Series No.115: **Personal Visual Aids for Aircrew** (with the Aerospace Medical Panel)
22–23 June 1981, Paris, France
25–2 June 1981, Fürstenfeldbruck, Germany

The purpose of this Lecture Series will be to review:

- The various conventional modes of optical correction required either by ametropias or by normal or pathological drops in visual acuity;
  The various optical correction by means of contact visual aids.
- The individual brilliance enhancement systems for night flights conditions.
- The harmful effects, on the ocular apparatus, of various radiations (ultraviolet, infrared, visible spectrum, ionizing radiations, laser, nuclear weapons);
- Protective means against these various aggressions.

A round-table discussion will close the Lecture Series during which the participants will be invited to present their comments or short papers.

Lecture Series Director: Medecin en Chef J.Chevaleraud, Ecole d'Application du Service de Santé pour l'Armée de l'Air, Paris Armées, France.

Lecture Series No.116: **Electromagnetic Compatibility** (with the Avionics Panel)
31 August - 1 September 1980, Bölkesjo, Norway
3 - 4 September 1981, Munich, Germany
7 - 8 September 1981, Rome, Italy

This Lecture Series will describe methodology for the prediction analysis, and test of electromagnetic interference. Current EMC practices and procedures to achieve electromagnetic compatibility within complex weapon systems will be discussed. Topics for discussion include electric current distribution, antenna-to-antenna coupling, intermodulation effects, and spurious responses. Existing data bases for EMC analysis and design, design techniques, and design tools will also be described.

A round-table discussion will close the Lecture Series and participants will be invited to make comments or present suggestions for future work.

Lecture Series Director: Mr John F.Spina, Rome Air Development Center (RBCT), Griffiss Air Force Base, USA.

Lecture Series No.117: **Multi-Variable Analysis and Design Techniques** (with the Guidance and Control Panel)
1–2 October 1981, Bölkesjo, Norway
5–6 October 1981, Delft, Netherlands
8–9 October 1981, Ankara, Turkey

The Lecture Series is intended to provide the basic theories and concepts involved in the design of advanced guidance and control systems employing state-space and multi variable design methods. An intricate part of this Lecture Series will be computer aided and graphical techniques that can be employed in preliminary design and related analysis methods. This will provide one document which covers the necessary design background and state-of-the-art involved in the application of advancing technologies.

Among the main topics, will be reviewed:

- Analysis and Synthesis Techniques.
- Application of Observer and Estimation Principles.
- Computer-Aided Design and Analysis Methods.
- System Simulation Techniques.
- Test Evaluation and Validation.

The Lecture Series Director will chair a round-table discussion at the end of the presentations during which comments and suggestions will be expected from participants.

Lecture Series Director: Dr R.E.Pope, Section Chief, Honeywell Systems and Research Center, Minneapolis, USA.

Lecture Series No.118: **Fatigue Test Methodology** (with the Structures and Materials Panel)
19–20 October 1981, Copenhagen, Denmark
22–23 October 1981, Lisbon, Portugal
26–27 October 1981, Athens, Greece

This Lecture Series will concentrate on fatigue testing of specimens and small components rather than full scale structures.

Among the main topics covered by the Lecture Series are:

- Tests under variable amplitude loading, including the use of standard sequences such as FALSTAFF and TWIST.
- Testing under simulated varying environmental conditions.
- Specimen design.
- Possibilities of and problems with computerized control,
- Practical examples will be given of various real cases, problems and techniques used.

A round-table discussion will be organized during which the participants will have an opportunity to obtain answers on specific questions.

Lecture Series Director: Dr P.R.Edwards, Structures Dept, Royal Aircraft Establishment, Farnborough, UK.

SPECIAL COURSES 1981

FMP - **Special Course on Flight Test Instrumentation**
11–22 May, 1981, Delft University of Technology, Netherlands

In 1975 the Flight Mechanics Panel sponsored a Course on Flight Test Instrumentation at Cranfield Institute of Technology, UK. The aim of the Course was to provide flight test instrumentation engineers with both the theory and practical application of instrumentation techniques; classroom instruction was enhanced by flight experiences in the CIT laboratory aircraft.

The Course was repeated in 1977 at DFVLR Braunschweig, with the support of the CIT aircraft and staff, and again at Cranfield in 1979. The participants' comments on the value of the instruction received appear to justify a further Course in 1981. On this occasion the Netherlands National Delegates have extended an invitation to hold the Course at Delft University of Technology; CIT aircraft and staff would again participate. Funding from the AGARD Consultant and Exchange Programme will support the contributions of around four lecturers from DFVLR and other NATO nations; the remaining costs will be met by a Course Fee paid by each participant.

Course Director: Mr L.Lucassen, National Aerospace Laboratory (NLR), Amsterdam, The Netherlands.

FDP/SMP - **Special Course on Modern Data Analysis Techniques in Noise and Vibration Problems with Particular Emphasis on Aero-acoustic Applications**
7–11 December 1981, VKI, Brussels, Belgium

Scope, Content: After a brief review of classical methods, the principles and general theorems and domains of application of modern methods of data analysis will be presented. This will be followed by details of the instrumentation requirements for the implementation of these methods and of the practical problems which arise. Finally, applications to noise and vibration problems will be considered, with reference to particular examples, many of

which are chosen to illustrate the intimate connection between acoustics and vibrations in aeroacoustics.

Course Director: Mr Mario Perulli, ONERA, Châtillon-sous-Bagneux, France.

MILITARY COMMITTEE STUDIES

20th Meeting of the **Aerospace Applications Studies Committee** (Classified)
18–20 May 1981, London, UK

The Committee will hold the initial review of AAS-14, "Mission Applications for V/STOL Combat Aircraft" and the final review of AAS-13, "Signature Reduction". Terms of reference for AAS-15 and AAS-16 will be finalized and the organization of the AAS-15 Study Group will be established.

21st Meeting of the **Aerospace Applications Studies Committee** (Classified)
16–18 November 1981, Washington, D.C., USA

The final review of AAS-14 "Mission Applications for V/STOL Combat Aircraft" and the initial review of AAS-15 will be accomplished. Proposals for new Aerospace Applications Studies will be reviewed and their terms of reference refined as required. The organization for the AAS-16 Study Group will be established. Terms of Reference for AAS-16 will be finalized.

SECTION II

1980 AGARD PUBLICATIONS

- 1980 AGARD PUBLICATIONS BY SERIES
- ABSTRACTS OF 1980 AGARD PUBLICATIONS BY PANEL OR ACTIVITY

ABBREVIATIONS

AMP	AEROSPACE MEDICAL PANEL
AVP	AVIONICS PANEL
EPP	ELECTROMAGNETIC WAVE PROPAGATION PANEL
FMP	FLIGHT MECHANICS PANEL
FDP	FLUID DYNAMICS PANEL
GCP	GUIDANCE AND CONTROL PANEL
PEP	PROPULSION AND ENERGETICS PANEL
SMP	STRUCTURES AND MATERIALS PANEL
TIP	TECHNICAL INFORMATION PANEL
MCS	MILITARY COMMITTEE STUDIES
LS	LECTURE SERIES

1980 AGARD PUBLICATIONS, BY SERIES

ADVISORY REPORTS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AR103 Volume 3	ADVANCED TECHNOLOGY TO COUNTER THE LOW ALTITUDE THREAT (OTHER THAN AIRCRAFT MOUNTED RADAR) Aerospace Applications Study No.9 (Classified)	June	MCS
AR120 Volume 2	COMMUNICATIONS DEVICES SUPPORTING AIR WARFARE WITH REDUCED SUSCEPTIBILITY TO JAMMING, INTERCEPT, AND LOCATION DETERMINATION (Classified)	April	MCS
AR139	TECHNICAL EVALUATION REPORT on the AEROSPACE MEDICAL PANEL WORKING GROUP WG-8 on EVALUATION OF METHODS TO ASSESS WORKLOAD B.O.Hartmann	November	AMP
AR 143	TECHNICAL EVALUATION REPORT on the FLIGHT MECHANICS PANEL SYMPOSIUM on MISSILE SYSTEM FLIGHT MECHANICS (Classified) W.E.Lamar	October	FMP
AR147 Volume IIA	REPORT FROM THE GUIDANCE AND CONTROL PANEL WORKING GROUP 04 on THE IMPACT OF GLOBAL POSITIONING SYSTEM ON GUIDANCE AND CONTROLS SYSTEMS DESIGN OF MILITARY AIRCRAFT. SPECIFIC APPLICATION STUDY No.1: CLOSE AIR SUPPORT L.J.Urban (Editor)	February	GCP
AR147 Volume IIC	REPORT FROM THE GUIDANCE AND CONTROL PANEL WORKING GROUP 04 on THE IMPACT OF GLOBAL POSITIONING SYSTEM ON GUIDANCE AND CONTROLS SYSTEMS DESIGN OF MILITARY AIRCRAFT. SPECIFIC STUDY No.3: INTERDICTION STRIKE (Classified) P.Manville (Editor)	June	GCP
AR147 Volume IID	REPORT FROM THE GUIDANCE AND CONTROL PANEL WORKING GROUP 04 on THE IMPACT OF GLOBAL POSITIONING SYSTEM ON GUIDANCE AND CONTROLS SYSTEMS DESIGN OF MILITARY AIRCRAFT. SPECIFIC APPLICATION STUDY No.4: STRIKE RPV K.Hurrass and H.Winter (Editors)	February	GCP
AR149	TECHNICAL EVALUATION REPORT ON THE 29th GUIDANCE AND CONTROL PANEL SYMPOSIUM on AIR TRAFFIC MANAGEMENT. Military Systems and Technologies C. de Bruyn	March	GCP
AR150	TURBULENT TRANSPORT PHENOMENA - LES PHENOMENES DE TRANSPORT TURBULENT M.L.Barrere	February	PEP
AR152	TECHNICAL EVALUATION REPORT on the PROPULSION AND ENERGETICS PANEL 54th(A) MEETING on ADVANCED CONTROL SYSTEMS FOR AIRCRAFT POWERPLANTS J.D.Powell	March	PEP
AR153	TECHNICAL EVALUATION REPORT on the PROPULSION AND ENERGETICS PANEL 54th(B) MEETING on COMBUSTOR MODELLING D.Dryburgh and R.B.Edelman	March	PEP
AR154	TECHNICAL EVALUATION REPORT on the 30th GUIDANCE AND CONTROL PANEL TECHNICAL MEETING: Symposium on GUIDANCE AND CONTROL ASPECTS OF TACTICAL AIR-LAUNCHED MISSILES J.M.Gonzalez	October	GCP

ADVISORY REPORTS
(Continued)

Name	*Title/Author/Editor*	*Publication Date*	*Activity*
AR157	TECHNICAL EVALUATION REPORT on the FLUID DYNAMICS PANEL SYMPOSIUM on AERODYNAMIC CHARACTERISTICS OF CONTROLS H.H.B.M.Thomas	March	FDP
AR158	TECHNICAL EVALUATION REPORT on the FLIGHT MECHANICS PANEL SYMPOSIUM on THE USE OF COMPUTERS AS A DESIGN TOOL Prf. Dr-Ing. S.Wagner	March	FMP
AR159	FIDELITY OF SIMULATION FOR PILOT TRAINING	December	AMP
AR160	PROJECT 2000 OVERVIEW SECOND PRINTING, WITH EDITORIAL REVISIONS (Classified)	March	MCS
AR161 Volume 1	ATTACK OF SURFACE TARGETS - SUMMARY REPORT. SECOND PRINTING, WITH EDITORIAL REVISIONS (Classified)	March	MCS
AR161 Volume 2	ATTACK OF SURFACE TARGETS MAIN REPORT (Classified)	July	MCS
AR162 Volume 1	DEFENCE AGAINST MISSILES - SUMMARY REPORT. SECOND PRINTING, WITH EDITORIAL REVISIONS (Classified)	March	MCS
AR 162 Volume 2	DEFENCE AGAINST MISSILES - MAIN REPORT (Classified)	June	MCS
AR 163 Volume 1	DETECTION, LOCATION AND RECOGNITION OF GROUND TARGETS - SUMMARY REPORT. SECOND PRINTING, WITH EDITORIAL REVISIONS (Classified)	March	MCS
AR163 Volume 2	DETECTION, LOCATION AND RECOGNITION OF GROUND TARGETS MAIN REPORT (Classified)	August	MCS

REPORTS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
R673	COMPARATIVE MEASUREMENTS IN FOUR EUROPEAN WIND TUNNELS OF THE UNSTEADY PRESSURES ON AN OSCILLATING MODEL (THE NORA EXPERIMENTS) N.Lambourne, R.Destuynder, K.Kienappel and R.Roos	February	SMP
R676	REQUIREMENTS, DESIGN AND DEVELOPMENT OF LARGE SPACE ANTENNA STRUCTURES	May	SMP
R678	CRITICALLY LOADED HOLE TECHNOLOGY - PILOT COLLABORATIVE TEST PROGRAMME - FINAL TECHNICAL REPORT T.Coombe and R.B.Urzi	November	SMP
R679	SPECIAL COURSE ON UNSTEADY AERODYNAMICS	June	FDP
R683	DESIGN, DEVELOPMENT AND IMPLEMENTATION OF AN ACTIVE CONTROL SYSTEM FOR LOAD ALLEVIATION FOR A COMMERCIAL TRANSPORT AIRPLANE R.F.O'Connell	February	SMP
R685	AIRCRAFT DYNAMIC RESPONSE TO DAMAGED RUNWAYS	March	SMP
R687	MATHEMATICAL MODELING OF LINEAR AND NON-LINEAR AIRCRAFT STRUCTURES	July	SMP

REPORTS
(Continued)

Name	*Title/Author/Editor*	*Publication Date*	*Activity*
R688	COMPARAISON DES CHAMPS DE PRESSION INSTATIONNAIRES CALCULES ET MESURES SUR LE MODEL ZKP M.Couston, J.J.Angélini, J.P.Meurzec	August	SMP
R689	REPORT ON A COOPERATIVE PROGRAMME ON ACTIVE FLUTTER SUPPRESSION	August	SMP

AGARDOGRAPHS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
AG160 Volume 10	HELICOPTER FLIGHT TEST INSTRUMENTATION K.R.Ferrell	July	FMP
AG 160 Volume 11	PRESSURE AND FLOW MEASUREMENT W.Wuest	July	FMP
AG160 Volume 12	AIRCRAFT FLIGHT TEST DATA PROCESSING – A REVIEW OF THE STATE-OF-THE-ART L.J.Smith and N.O.Matthews	November	FMP
AG235 Volume III	MANUAL OF DOCUMENTATION PRACTICES APPLICABLE TO DEFENCE-AEROSPACE SCIENTIFIC AND TECHNICAL INFORMATION S.C.Schuler (General Editor)	October	TIP
AG247	SIGNIFICANCE OF CIRCADIAN RHYTHMS IN AEROSPACE OPERATIONS K.E.Klein and H.M.Wegmann	December	AMP
AG248	THE USE OF SIMULATORS FOR TRAINING INFLIGHT AND EMERGENCY PROCEDURES E.E.Eddowes and W.L.Waag	June	AMP
AG252	THREE-DIMENSIONAL INTERACTIONS AND VORTICAL FLOWS WITH EMPHASIS ON HIGH SPEEDS D.J.Peake, M.Tobak; R.H.Korkegi (Editor)	July	FDP
AG253	A CRITICAL COMMENTARY ON MEAN FLOW DATA FOR TWO-DIMENSIONAL COMPRESSIBLE TURBULENT BOUNDARY LAYERS H.H.Fernholz and P.J.Finley	May	FDP
AG255	ADVANCEMENT ON VISUALIZATION TECHNIQUES W.H.Hollister	October	GCP
AG257	PRACTICAL APPLICATIONS OF FRACTURE MECHANICS H.Liebowitz	May	SMP
AG258	GUIDANCE AND CONTROL SOFTWARE L.J.Urban (Editor)	May	GCP

CONFERENCE PROCEEDINGS

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
CP266	OPERATIONAL ROLES, AIRCREW SYSTEMS AND HUMAN FACTORS IN FUTURE HIGH PERFORMANCE AIRCRAFT D.F.Iampietro (Editor)	March	AMP
CP267	HIGH-SPEED, LOW-LEVEL FLIGHT: AIRCREW FACTORS D.H.Glaister (Editor)	March	AMP

CONFERENCE PROCEEDINGS
(Continued)

Number	*Title/Author/Editor*	*Publication Date*	*Activity*
CP268	MODELLING AND SIMULATION OF AVIONICS SYSTEMS AND COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	January	AVP
CP271	TURBULENT BOUNDARY LAYERS – EXPERIMENTS, THEORY AND MODELLING	January	FDP
CP273	AIR TRAFFIC MANAGEMENT. CIVIL/MILITARY SYSTEMS AND TECHNOLOGIES	February	GCP
CP273 (Supp.)	AIR TRAFFIC MANAGEMENT. CIVIL/MILITARY SYSTEMS AND TECHNOLOGIES (Classified)	March	GCP
CP274	ADVANCED CONTROL SYSTEMS FOR AIRCRAFT POWERPLANTS	February	PEP
CP275	COMBUSTOR MODELLING	February	PEP
CP276	CERAMICS FOR TURBINE ENGINE APPLICATIONS	March	SMP
CP279	INTERNATIONAL ACCESS TO AEROSPACE INFORMATION	April	TIP
CP280	THE USE OF COMPUTERS AS A DESIGN TOOL	January	FMP
CPP281	TESTING AND MEASUREMENT TECHNIQUES IN HEAT TRANSFER AND COMBUSTION (Preprints)	April	PEP
CP281	TESTING AND MEASUREMENT TECHNIQUES IN HEAT TRANSFER AND COMBUSTION	September	PEP
CPP282	CENTRIFUGAL COMPRESSORS, FLOW PHENOMENA AND PERFORMANCE (Preprints)	April	PEP
CP282	CENTRIFUGAL COMPRESSORS, FLOW PHENOMENA AND PERFORMANCE	November	PEP
CPP283	ELECTROMAGNETIC EFFECTS OF (CARBON) COMPOSITE MATERIALS UPON AVIONICS SYSTEMS (Preprints)	June	AVP
CP283	ELECTROMAGNETIC EFFECTS OF (CARBON) COMPOSITE MATERIALS UPON AVIONICS SYSTEMS F.S.Stringer (Editor)	October	AVP
CPP284	PROPAGATION EFFECTS IN SPACE/EARTH PATHS (Preprints)	May	EPP
CP284	PROPAGATION EFFECTS IN SPACE/EARTH PATHS	August	EPP
CPP285	SUBSONIC/TRANSONIC CONFIGURATION AERODYNAMICS (Preprints)	April	FDP
CP285	SUBSONIC/TRANSONIC CONFIGURATION AERODYNAMICS	September	FDP
CPP286	AIRCREW SAFETY AND SURVIVABILITY (LIMITED TO COMBAT AIRCRAFT) (Preprints)	April	AMP
CP286	AIRCREW SAFETY AND SURVIVABILITY (LIMITED TO COMBAT AIRCRAFT) R.Auffret (Editor)	October	AMP

CONFERENCE PROCEEDINGS
(Continued)

Name	*Title/Author/Editor*	*Publication Date*	*Activity*
CPP287	SPATIAL DISORIENTATION IN FLIGHT: CURRENT PROBLEMS (Preprints)	April	AMP
CP287	SPATIAL DISORIENTATION IN FLIGHT: CURRENT PROBLEMS G.F.Perdriel and A.J.Benson (Editors)	October	AMP
CP288	EFFECT OF SERVICE ENVIRONMENT ON COMPOSITE MATERIALS	August	SMP
CP289	DESIGN TO COST AND LIFE CYCLE COST	July	FMP
CPP290	IMAGE AND SENSOR DATA PROCESSING FOR TARGET ACQUISITION AND RECOGNITION (Preprints)	September	AVP
CP290	IMAGE AND SENSOR DATA PROCESSING FOR TARGET ACQUISITION AND RECOGNITION	November	AVP
CP290 (Supp.)	IMAGE AND SENSOR DATA PROCESSING FOR TARGET ACQUISITION AND RECOGNITION (Classified)	December	AVP
CPP291	COMPUTATION OF VISCOUS-INVISCID INTERACTIONS (Preprints)	August	FDP
CP292	GUIDANCE AND CONTROL ASPECTS OF TACTICAL AIR-LAUNCHED MISSILES	October	GCP
CP292 (Supp.)	GUIDANCE AND CONTROL ASPECTS OF TACTICAL AIR-LAUNCHED MISSILES (Classified)	Ocbtober	GCP
CPP293	TURBINE ENGINE TESTING (Preprints)	September	PEP
CPP294	INFORMATION SERVICES: THEIR ORGANIZATION, CONTROL AND USE (Preprints)	October	TIP
CPP295	THE PHYSICAL BASIS OF THE IONOSPHERE IN THE SOLAR-TERRESTRIAL SYSTEM (Preprints)	October	EPP

LECTURE SERIES

Name	*Title/Author/Editor*	*Publication Date*	*Activity*
LS104	PARAMETER IDENTIFICATION	November (79)	DPP
LS106	MATERIALS COATING TECHNIQUES	March	DPP
LS107	THE APPLICATION OF DESIGN TO COST AND LIFE CYCLE COST TO AIRCRAFT ENGINES	May	DPP
LS108	AIRCRAFT ASSESSMENT AND ACCEPTANCE TESTING	May	DPP
LS109	FAULT TOLERANCE DESIGN AND REDUNDANCY MANAGEMENT TECHNIQUES	September	DPP
LS110	ATMOSPHERIC ELECTRICITY – AIRCRAFT INTERACTION	May	DPP
LS111	CRYOGENIC WIND TUNNELS	July	DPP
LS112	PATENTS - AN INFORMATION RESOURCE	September	DPP

MISCELLANEOUS

Name	*Title/Author/Editor*	*Publication Date*	*Activity*
	AGARD BULLETIN 1980/1: MEETINGS, PUBLICATIONS, MEMBERSHIP	February	HQ
	AGARD HIGHLIGHTS 1980/1	March	HQ
	DIRECTOR'S ANNUAL REPORT TO THE NORTH ATLANTIC MILITARY COMMITTEE 1979	April	HQ
	AGARD CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETINGS (JULY 1980 – DECEMBER 1981)	June	HQ
	AGARD HANDBOOK (Revised)	July	HQ
	AGARD INDEX OF PUBLICATIONS 1977–1979	August	TIP
	AGARD BULLETIN 1980/2	August	HQ
	AGARD HIGHLIGHTS 1980/2	September	HQ
	AGARD CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETINGS (JANUARY 1981 – JUNE 1982)	December	HQ

ABSTRACTS OF 1980 AGARD PUBLICATIONS, BY PANEL OR ACTIVITY

AEROSPACE MEDICAL PANEL (AMP)

Conference Proceedings 266
P.F.Iampietro (Editor)
March 1980
100 pages
ISBN 92-835-0262-0

Operational Roles, Aircrew Systems and Human Factors in Future High Performance Aircraft

Any new system is no more effective than its human operators, whose sensory, muscular and cognitive capabilities it merely extends when responding to mission and environmental stress.

The purpose of this meeting session was to understand the operational characteristics of the new high-performance aircraft to be shortly introduced into the NATO Forces in relationship to the operator's physiological, cognitive, psychomotor and perceptual capabilities.

For the first time at an AMP meeting, pilots, engineers and aviation medicine specialists convened together to discuss relationships between man and machine in order to identify any biotechnology research deficiencies and establish appropriate selection, training and assignment criteria for future high-performance aircraft.

Conference Proceedings 267
D.H.Glaister (Editor)
March 1980
336 pages
ISBN 92-835-0263-9

High-Speed, Low-Level Flight: Aircrew Factors

Recent developments in radar and missile systems indicate that high-speed flight at low-levels offers the optimum means for reaching targets deep within defended territory while, unfortunately, imposing considerable physical and mental stresses on the aircrew.

The 22 papers presented by experts within the compass of Guidance and Control, Flight Mechanics and Aerospace Medicine discussed the effects of ride quality, physical environment, temperature, vibrations as well as the requirements for the cockpit design, escape and survival in low-level, high-speed flight.

Recommendations were put forward for improvements in systems management techniques, modifications to existing systems and design of new ones in order to enhance the performance of the man and the system and improve the chances of survival of both in this demanding operational environment by reducing the workload imposed on the aircrew.

Conference Preprint 286
April 1980
68 pages

Aircrew Safety and Survivability (Limited to Combat Aircraft)

Preprints of papers delivered at Meeting in Bodø, Norway, May 1980.

Conference Preprints 287
April 1980
64 pages

Spatial Disorientation in Flight: Current Problems

Preprints of papers delivered at Meeting in Bodø, Norway, May 1980.

AGARDograph 248
E.E.Eddowes and W.L.Waag
June 1980
38 pages
ISBN 92-835-1363-0

The Use of Simulators for Training In-Flight and Emergency Procedures

The reduced availability and high cost of fuel has led to increased emphasis on the use of simulators for in-flight and emergency procedures training.

The nature of pilot skills is examined and the report suggests a strategy for the use of simulators to acquire and maintain them.

The salient characteristics of the latest flight simulator and the visual display system capabilities they provide for training contact flying tasks are described. Research on transfer of learning from simulator to aircraft in a variety of training tasks is reviewed. The use of simulators as aircraft substitutes, and their integration with other ground training media are composed and contrasted to illustrate the cost-effectiveness potential of these two approaches.

The rationale for and the characteristics of a simulator-oriented emergency procedures training programme which emphasises pilot decision making skills are presented.

The development of aircrew performance measurement systems for use in evaluating, refining and documenting simulator training effectiveness is reported.

The AGARDograph ends with an interpretation of the impact of current developments on the future use of simulators; a list of conclusions is provided.

Conference Proceedings 286
R.Auffret (Editor)
October 1980
174 pages
ISBN 92-835-0279-5

Aircrew Safety and Survivability (Limited to Combat Aircraft)
The safety of aircrews and their ability to survive from a medical standpoint under normal and emergency situations, is a prime objective of Aviation Medicine. Each aeronautical innovation requires the updating of the factors contributing to safety and rescue.

The 21 papers presented by experts within this field discuss protection against cold, emergency ejection accidents, survivability equipment and crew performance during difficult missions.

Recommendations include improvements to equipment to improve the chances of survival, the adoption of some standard method of evaluating anti-exposure suits and, not least, radiographic screening of the spine during aircrew training to, inter alia, exclude those with conditions incompatible with flight.

Conference Proceedings 287
G.F.Perdriel and A.J.Benson (Editors)
October 1980
104 pages
ISBN 92-835-0278-7

Spatial Disorientation in Flight: Current Problems
The importance of spatial disorientation as a cause of aircraft accidents was last addressed by the Aerospace Medical Panel in 1971. In the years since then, there have been developments and changes in operational roles, aircraft instrumentation, and in aircrew training which are likely to have had an impact on the aetiology and incidence of spatial disorientation, and the Panel considered it timely to again discuss the topic.

The eleven papers presented by experts in the field discuss not only the contemporary problems and causal mechanisms but also the measures that are available to minimise loss of life and aircraft because of spatial disorientation.

Advisory Report 139
B.O.Hartmann
November 1980
18 pages
ISBN 92-835-1374-6

Technical Evaluation Report on the Aerospace Medical Panel Working Group WG-08 on Evaluation of Methods to Assess Workload
Military aircraft are becoming increasingly complex, the associated avionics systems more sophisticated, and the mission profiles more demanding. The problem is to establish if such an increase in aircrew workload has become a limiting factor in the operational employment of some aircraft and to select viable methods to assess it.

The methods of assessing workload are set forth in AGARDograph AG-246 "Survey of Methods to Assess Workload" which was published in August 1979. This companion document sets forth conclusions on workload measurement methodology.

Advisory Report 159
December 1980
68 pages
ISBN 92-835-1377-0

Fidelity of Simulation for Pilot Training
Technology is allowing the simulation of increasingly complex flight situations with more and more fidelity. High fidelity generally implies high cost, but high fidelity is not always necessary to obtain satisfactory training. This report addresses the subject of fidelity of simulation for pilot training and provides background to specialists in the multiple disciplines involve. Topics presented in detail are: the training psychologist's views on fidelity of simulation required to train, and methods of assessing this fidelity; the physiologist's survey of pilot cueing mechanisms, in particular those provided by motion or visually induced motion sensations; and the simulator technologist's assessment of existing motion, visual and aircraft mathematical model technology and the characteristics which could be expected to provide high perceptual fidelity.

In each of these disciplines deficiencies were identified in the current ability to relate simulator fidelity to the needs for pilot training and recommendations are made for structuring future research efforts.

This report was prepared by a Working Group co-sponsored by the Aerospace Medical Panel and the Flight Mechanics Panel of AGARD.

AGARDograph No.247
K.E.Klein and H.M.Wegmann
December 1980
64 pages
ISBN 92-835-1378-9

Significance of Circadian Rhythms in Aerospace Operations
For over a century it has been recognised that the functional state of the human body is subject to periodic daytime-dependant oscillations which are called "Circadian Rhythms". Not only wakefulness and sleep alternate with the environmental light-dark cycle, for it has been established that most physiological, psychological and behavioural functions have an oscillatory nature. Certain hours of the 24 hour cycle have been identified as those where the tonic physiologic levels are set for sleep and "readiness for efficiency" is reduced. Though the underlaying mechanisms for biologic circadian periodicity are as yet unknown, its relationship with the environment and with controlling endogenous and exogenous factors has become increasingly clear.

Because performance efficiency and health are affected, circadian rhythmicity has become a major concern not only for industrial shift work. This AGARDograph, together with those previously published on "Operational Aspects of Variations in

Alertness" (No.131) and "The Operational Consequences of Sleep Deprivation and Sleep Deficit" (159), as well as the Lecture Series on "Sleep, Wakefulness and Circadian Rhythm" (232) should present a useful source of planning and managing aerospace operations in harmony with human functional capacity.

AVIONICS PANEL (AVP)

Conference Proceedings 268
January 1980
572 pages
ISBN 92-835-0255-8

Modeling and Simulation of Avionics Systems and Command, Control and Communications Systems
These Proceedings consist of the papers and discussions presented at the Avionics Panel Meeting on Modeling and Simulation held in Paris, France, October 1979. Papers were divided as follows: 6 – Tutorial, 8 – C^3 System Simulation, 5 – Airborne Surveillance System Simulation, 5 – Manned Flight Simulators, 4 – Identification, Communication Navigation, and Countermeasure Simulation, and 11 on Avionics System Simulation.

Conference Preprint 283
June 1980
84 pages

Electromagnetic Effects of (Carbon) Composite Materials upon Avionics Systems
Preprints of papers delivered at Meeting in Lisbon, June 1980.

Conference Preprint 290
September 1980
136 pages

Image and Sensor Data Processing for Target Acquisition and Recognition
Preprints of papers delivered at Meeting in Aalborg, September 1980.

Conference Proceedings 283
F.S.Stringer (Editor)
October 1980
382 pages
ISBN 92-835-0277-9

Electromagnetic Effects of (Carbon) Composite Materials upon Avionics Systems
These Conference Proceedings consist of the papers and discussions from the 39th Meeting of the Avionics Panel of the Advisory Group for Aerospace Research and Development NATO. Subject of the Meeting was the effects of introduction of composite materials on Avionics Systems. The meeting addressed the overall impact of composites electronically as well as providing some review of state of the art in use of composites in aircraft. Three papers were on materials and applications, 6 on characteristics, measurements, modelling and standards, 6 on specific research programs, 4 on electromagnetic effects on radiation patterns and lightning problems, and four on protection and tradeoff methods.

Conference Proceedings 290
November 1980
274 pages
ISBN 92-835 0280-9

Image and Sensor Data Processing for Target Acquisition and Recognition
These Proceedings contain the Unclassified papers presented at the 40th Technical Meeting of the Avionics Panel of AGARD, which was held in Aalborg, Denmark 8–12 September, 1980. They consist of 21 papers on the subject of "Image and Sensor Data Processing for Target Acquisition and Recognition", which are divided as follows: target backgrounds and visibility, 3; man-machine interaction, 2; image processing, 6; target tracking, 4; target classification and identification, 6. The companion volume which is classified Nato-Secret contains the remaining 17 papers which were classified and the discussions and summary. If possible both texts should be reviewed simultaneously.

Conference Proceedings 290
(Supplement)
(Classified)
December 1980
234 pages

Image and Sensor Data Processing for Target Acquisition and Recognition
These Proceedings contain the Classified papers, summary and discussion presented at the 40th Technical Meeting of the Avionics Panel of AGARD, which was held in Aalborg, Denmark, 8–12 September, 1980. They consist of 17 papers on the subject "Image and Sensor Data Processing for Target Acquisition and Recognition", which are divided as follows: overview, 1; target backgrounds and visibility, 5; man-machine interaction, 2; image processing, 3; target tracking, 3; target classification and identification, 4. The companion volume which is Unclassified contains the remaining 21 papers which were unclassified. If possible both texts should be reviewed simultaneously.

ELECTROMAGNETIC WAVE PROPAGATION PANEL (EPP)

Conference Preprint 284
May 1980
336 pages

Propagation Effects in Space/Earth Paths
Preprints of papers delivered at Meeting in London, May 1980.

Conference Proceedings 284
August 1980
536 pages
ISBN 92-835-0269-8

Propagation Effects in Space/Earth Paths
These Proceedings include the papers and discussions presented at the AGARD Electromagnetic Wave Propagation Panel Symposium on "Propagation Effects in Space/Earth Paths" held in London in May 1980. The Symposium addressed both military and civil applications and problems in satellite communication. Theoretical and experimental aspects of slant path propagation through both ionized and non-ionized media are addressed. Atmospheric effects included attenuation, refraction, and depolarization and resulting scintillation, multipath, absorption and scatter.

The 38 papers were divided as follows: 8 on tropospheric effects, 10 on experimental data of SHF/EHF Paths, 3 on remote sensing, 6 on general ionospheric dispersion, 6 on ionospheric irregularities, and 5 on propagation limitations in systems.

Conference Preprint 295
October 1980
142 pages

The Physical Basis of the Ionosphere in the Solar-Terrestrial System
Preprints of papers delivered at Meeting in Pozzuoli, October 1980.

FLIGHT MECHANICS PANEL (FMP)

Conference Proceedings 280
January 1980
460 pages
ISBN 92-835-0256-6

The Use of Computers as a Design Tool
The proceedings consist of the papers presented at the FMP Symposium on "The Use of Computers as a Design Tool". Sessions were held on the topics of: specifications and assessments of requirements, computer-aided design and computer graphics, computational aerodynamics and design, structural analysis and design, propulsion and systems design. A comprehensive Technical Evaluation of the meeting appears in AGARD Advisory Report No.158.

Advisory Report 158
S.Wagner
March 1980
21 pages
ISBN 92-835-1353-3

Technical Evaluation Report on the Flight Mechanics Panel Symposium on the Use of Computers as a Design Tool
This report evaluates the AGARD Flight Mechanics Panel Symposium on "The Use of Computers as a Design Tool" held from 3–6 September 1979 at Neubiberg, Germany. The primary conclusions were that the human being still plays a critical role during all steps of computerized aircraft design and that remarkable progress has been made in many areas related to aircraft design because of recent developments in computer hardware and software. However, there are still areas where the design has to rely on wind tunnel and structural testing. The computer has reduced the routine work-load of the engineer to save time for creative work. But there is still a need for faster and larger computers that will probably incorporate new architectures.

Recommendations are made for future activities by AGARD. The full papers of the Proceedings are published as AGARD Conference Proceedings No.280

Conference Proceedings 289
July 1980
346 pages
ISBN 92-835-0268-X

Design to Cost and Life Cycle Cost
These proceedings consist of the papers presented at the FMP Symposium on Design to Cost and Life Cycle Cost. The papers cover: LCC methodology and its relation to specifications and requirements; the impact of LCC analysis on total system design; cost control of operations and support, and LCC of subsystems and components. A comprehensive Technical Evaluation of the meeting appears in AGARD Advisory Report No.165.

AGARDograph 160
Volume 10
K.R.Ferrell
July 1980
48 pages
ISBN 92-835-1367-3

Helicopter Flight Test Instrumentation
This AGARDograph is the 10th of the AGARD Flight Test Instrumentation Series and discusses the helicopter characteristics with which the instrumentation must contend, outlining typical tests that are conducted. Major aircraft components and systems which may be instrumented are listed and suggestions are made for sensors, locations, and installation. Details are provided for instruments peculiar to helicopters. Interface of the test instrumentation with data recording systems and ground support facilities are also considered.

A summary of instrumentation requirements is provided along with recommended range, accuracy and resolution. A sample instrumentation management technique is also included.

AGARDograph 160
Volume 11
W.Wuest
July 1980
136 pages
ISBN 92-835-1368-1

Pressure and Flow Measurement
This AGARDograph is the 11th of the AGARD Flight Test Instrumentation Series, and discusses the fundamentals of pressure and flow measurement from the viewpoint of flight test instrumentation. The evolution of flight test instrumentation systems during the last decade reflects the radical changes in electronic measuring techniques. Nevertheless, the basic principles of measurement methods are essentially unchanged and the sensors for pressure and flow measurements have experienced only slight changes. An overview of modern instrumentation is given with important applications to altitude measurement, vertical and horizontal speed measurement, boundary layer, wake and engine flow measurement. The scope of this AGARDograph is to give self consistent information on the different techniques and systems and to give references for a more detailed study of special techniques.

Advisory Report 143
(Classified)
W.E.Lamar
October 1980
50 pages

Technical Evaluation Report on the Flight Mechanics Panel Symposium on Missile System Flight Mechanics
This report evaluates the AGARD Flight Mechanics Panel Symposium on "Missile System Flight Mechanics" held from 21–24 May 1979 in London, England. The prime objectives of the meeting were to survey and interchange knowledge about missile flight mechanics, and identify areas in which an increased emphasis on the development and application of flight mechanics technologies could improve the effectiveness and/or reduce the cost of tactical missiles and their integration with carrier aircraft. The report presents a review of the meeting, with conclusions and recommendations for future activities.

The complete papers from the Symposium are published in AGARD Conference Proceedings No.270 (NATO Restricted) and No.270 Supplement (NATO Secret).

AGARDograph 160
Volume 12
L.J.Smith and N.O.Matthews
November 1980
66 pages
ISBN 92-835-1376-2

Aircraft Flight Test Data Processing – A Review of the State of the Art
This AGARDograph is the 12th of the AGARD Instrumentation Series and describes the application of data processing systems to produce data in support of flight testing. The generalized techniques are appropriate to large test centers which support multiple testing programs simultaneously. The concepts, however, are as equally valid for a single test program using a dedicated data processing system.

Starting from a discussion of data sources, the text proceeds to a review of the considerations required prior to data processing. A simplified discussion of two major components of data processing – hardware and software – follows. The volume then looks at the third major component of data processing – the people to make it work. The data processing in support of flight testing is described according to processing functions. An attempt is then made to identify potential problem areas.

Since every organization which conducts test flights develops its own methods and techniques for this purpose, it is not always possible to give specific details that can be universally applied. The intention is to present a general outline of the methods, techniques, and problems associated with data processing for the benefit of individuals not experienced in this field. It is hoped that experienced Flight Test Engineers will be able to make use of this review to assist with instructing new entrants to the field of flight test data processing and to stimulate future developments.

FLUID DYNAMICS PANEL (FDP)

Conference Proceedings 271
January 1980
398 pages
ISBN 92-835-0257-4

Turbulent Boundary Layers – Experiments, Theory and Modelling
The Symposium brought together experimental and theoretical research directed toward understanding the turbulent boundary layer, in both incompressible and compressible fluid flow. The development of computer modelling techniques taking experimental and theoretical results into account was also emphasized.

Descriptions of coherent vortex structures utilizing new methods of flow visualization and hot-wire anemometry were presented. Developments leading to a satisfactory theoretical understanding of nonlinear vortex interactions and the decomposition of fluctuating flow fields were also discussed at the meeting. Several papers treated the early development of turbulence during, or immediately following, transition.

Twenty-six papers and a summary discussion of the subject are included in the Proceedings.

Advisory Report 157
H.H.B.M.Thomas
March 1980
18 pages
ISBN 92-835-1351-7

Technical Evaluation Report on the Fluid Dynamics Panel Symposium on Aerodynamic Characteristics of Controls
This report presents an evaluation of the papers presented and the discussion held during the AGARD Fluid Dynamics Panel Symposium on Aerodynamic Characteristics of Controls held 14–17 May 1979 in Pozzuoli, Italy. A brief discussion of the presentations and discussions is followed by a summary of conclusions and recommendations for action. The full text of the papers is available in AGARD Conference Proceedings No.262, published in September 1979.

Conference Preprint 285
April 1980
196 pages

Subsonic/Transonic Configuration Aerodynamics
Preprints of papers delivered at Meeting in Neubiberg, May 1980.

AGARDograph 253
H.H.Fernholz and P.J.Finley
May 1980
228 pages
ISBN 92-835-1362-2

A Critical Commentary on Mean Flow Data for Two-Dimensional Compressible Turbulent Boundary Layers
This volume presents a discussion of mean flow profile data for compressible boundary layers. In AGARDograph 223, (Fernholz and Finley, 1977) the predecessor of this volume, data were presented for nominally two-dimensional flows for which mean flow profile data were available in tabular form. Data for 59 experimental boundary layer studies were given, with a brief introduction. Comment and discussion were reserved for this volume, AGARDograph 253. Suitable cross-references are given to relate the discussion in this volume to the earlier publication.

The commentary in this volume includes discussion of the theoretical basis for interpretation of measurements, concepts from low-speed studies, interpretation of mean flow data with and without pressure gradient. The causes of normal pressure gradients are described, so as to allow an estimation of their magnitude, and their influence on boundary layer scale lengths. A third volume is planned in this series, which will include additional data, some of which is discussed here.

AGARD Report 679
June 1980
242 pages
ISBN 92-835-1364-9

Special Course on *Unsteady Aerodynamics*
Unsteady aerodynamics play an important role in aircraft response, aircraft loads, vibration environments and flight systems analysis; this role is becoming more significant with the advent of active control technology (ACT). For internal flows in engines, turbomachinery and helicopter rotors, unsteady aerodynamics are dominant features.

The course provided a basic understanding of a range of related unsteady flow phenomena relevant to aeronautical applications, an awareness of the current state-of-the-art of prediction methods, and an appreciation of how unsteady aerodynamics are applied to contemporary practical problems.

The course covered the following areas:

- a qualitative understanding of the character of unsteady flows at subsonic, transonic and supersonic speeds, including viscous effects for both attached and separated flows.
- an outline of the contexts in which unsteady aerodynamics are required for aircraft stability and control, flutter, aircraft dynamics response, ACT, turbomachinery vibration and helicopter rotor operation.
- a survey of the state-of-the-art of the current prediction methods with particular emphasis on recent developments in unsteady transonics.
- a description of contemporary experimental techniques and apparatus.

The material assembled in this book was prepared under the combined sponsorship of the Fluid Dynamics Panel, the von Kármán Institute and the Consultant and Exchange Program of AGARD and was presented as an AGARD Special Course at the von Kármán Institute, Rhode-St-Genèse, Belgium on 10–14 March 1980.

AGARDograph 252
D.J.Peake and M.Tobak
R.H.Korkegi (Editor)
July 1980
226 pages
ISBN 92-835-1366-5

Three-Dimensional Interactions and Vortical Flows with Emphasis on High Speeds
Diverse kinds of three-dimensional regions of separation in laminar and turbulent boundary layers are discussed that exist on lifting aerodynamic configurations immersed in flows from subsonic to hypersonic speeds. One of the common ingredients is that a three-dimensional boundary layer will detach from a surface along a swept separation line (adjacent to which the skin-friction lines converge rapidly) and will usually form a well organized coiled motion in all speed regimes. The scale of the vortical flow relative to the undisturbed boundary-layer thickness δ_0 changes, depending on the configuration and its attitude to the free stream. In axial corner and bluff protuberance flows, the coiled shear layer is immersed within δ_0.

About slender bodies or sharp swept-back wings at angle of attack, the vortical flow is many tines larger than δ_0, compressibility generally suppressing the scale. In hypersonic flow, high rates of heat transfer are encountered along lines of reattachment (adjacent to which the skin friction lines diverge rapidly) that are associated with three-dimensional separation zones. The maximum rates of heat transfer – rates that may exceed the local stagnation point heating by factors of 10 or more – result from shock-on-shock interactions situated, not on the surface, but in the flow field in proximity to forward-facing parts of the airframe.

Conference Preprint 291
August 1980
264 pages

Computation of Viscous-Inviscid Interactions
Preprints of papers delivered at Meeting in Colorado Springs, September/October 1980.

Conference Proceedings 285
September 1980
462 pages
ISBN 92-835-0276-0

Subsonic/Transonic Configuration Aerodynamics
During the past decade, there has been significant progress in the development of transonic wind tunnel test techniques and computational methods. Employing these techniques, the aerodynamicist has developed many imaginative design concepts that have added to the optimization data base. It was the purpose of the symposium to review and assess these developments and project the future.

Twenty nine papers comprised the meeting with three invited review papers. There was a relatively even mixture of theoretical and experimental papers with many providing test/theory comparisons. Subject matter ranged from simple wing-fuselage interference for both fighter and airlift configurations to those envolving additional components such as nacelle and pylons, powered jets, winglets, and most importantly stores and weapons. The symposium was concluded by a Round Table discussion with invited introductory comments.

GUIDANCE AND CONTROL PANEL (GCP)

Conference Proceedings 273
February 1980
312 pages
ISBN 92-835-1347-9

Air Traffic Management. Civil/Military Systems and Technologies
The proceedings include papers presented at a symposium of the AGARD Guidance and Control Panel, held in Copenhagen, Denmark, 9–12 October 1979.

Twenty eight papers were presented on the following topics: Operational scene and requirements; Civil military cooperation; Aspects of air-traffic management philosophy – Criteria and human factors – Communications and separation; Air traffic management in hostile environment; Flight management in terminal area; Subsystem technology; Advanced systems.

Advisory Report 147
Volume IIA
L.J.Urban (Editor)
February 1980
72 pages
ISBN 92-835-1349-5

Report from the Guidance and Control Panel Working Group 04 on The Impact of Global Positioning System to Guidance and Controls Systems Design of Military Aircraft. Specific Application Study No.1: Close Air Support
The objectives of the Guidance and Control Panel Working Group 04 were to consider the integration of GPS in aircraft systems and make recommendations for implementation.

The Working Party report consists of two volumes:

Volume I includes NAVSTAR/GPS description, examination of technical aspects of the system, applications to Counter Air Operations, Air Interdiction, Close Air Support Operations, Sea Patrol and Strike RPV, and recommendations.

In *Volume II* are presented the results of four specific studies of the application of NAVSTAR to Close Air Support, Sea Patrol, Interdiction Strike and Strike RPV.

Volume IIA addresses the first of those specific studies. A currently available "model" was selected, namely the F.4E aircraft equipped with the ARN-101 weapon delivery system. This was selected since it represents the current state-of-the-art for externally aided (LORAN) digital avionics system integrated into a reasonably modern fighter aircraft which is currently in the operational inventory of several NATO countries. The study is unclassified and not NATO-Confidential as originally planned.

The report consists of one main document (Vol.I) and four appendices published separately (Volumes IIA, B, C and D).

Advisory Report 147
Volume IID
K.Hurrass and H.Winter (Editors)
February 1980
16 pages
ISBN 92-835-1350-9

Report from the Guidance and Control Panel Working Group 04 on The Impact of Global Positioning System on Guidance and Controls Systems Design of Military Aircraft. Specific Application Study No.4: Strike RPV

The objectives of the Guidance and Control Panel Working Group 04 were to consider the integration of GPS in aircraft systems and make recommendations for implementation.

The Working Party report consists of two volumes:

Volume I includes NAVSTAR/GPS description, examination of technical aspects of the system, applications to Counter Air Operations, Air Interdiction, Close Air Support Operations, Sea Patrol and Strike RPV, and recommendations.

In Volume II are presented the results of four specific studies of the application of NAVSTAR to Close Air Support, Sea Patrol, Interdiction Strike, and Strike RPV.

Volume IID addresses the fourth of those specific studies. The availability of the NAVSTAR/GPS opens the way to the use of simpler gyros in a strap-down system. The influence of GPS aiding of a strap-down system on the accuracy requirements for the gyros is investigated in this paper for a RPV mission. The study is unclassified and not NATO-Confidential as originally planned.

Advisory Report 149
C. de Bruyn
March 1980
19 pages
ISBN 92-835-1356-8

Technical Evaluation Report on the 29th Guidance and Control Panel Symposium on Air Traffic Management. Civil/Military Systems and Technologies

The GCP symposium was held in Copenhagen, Denmark, 9–12 October, 1979. The program as presented at the symposium is appended to this report. The complete compilation of papers has been published as Conference Proceedings No.273.

Conference Proceedings 273
(Supplement)
(Classified)
March 1980
76 pages

Air Traffic Management. Civil/Military Systems and Technologies

This publication is a classified supplement to AGARD Conference Proceedings No.273. The main unclassified document contains 23 papers on the following topics: Operational scene and requirements; Civil/military cooperation; Aspects of air traffic management philosophy – Criteria and human factors – Communications and separation; Air traffic management in hostile environment; Flight management in terminal area; Subsystem technology; Advanced systems.

AGARDograph 258
L.J.Urban (Editor)
May 1980
230 pages
ISBN 92-835-0267-1

Guidance and Control Software

The development of Computer Programs, which are referred to as Software is currently on the critical path of all weapon systems and developments. The AGARDograph, prepared at the request of the Guidance and Control Panel of AGARD, brings together related experience in the NATO community as a guide for future guidance and control software development. The AGARDograph is organized into two major parts: Part I deals with software design and managment while Part II covers software applications.

Advisory Report 147
Volume IIC
(Classified)
P.Manville (Editor)
June 1980
12 pages

Report from the Guidance and Control Panel Working Group 04 on The Impact of Global Positioning System on Guidance and Controls Systems Design of Military Aircraft. Specific Study No.3: Interdiction Strike

The objectives of the Guidance and Control Panel Working Group 04 were to consider the integration of GPS in aircraft systems and make recommendations for implementation.

The Working Party report consists of two volumes:

Volume I includes NAVSTAR/GPS description, examination of technical aspects of the system, applications to Counter Air Operations, Air Interdiction, Close Air Support Operations, Sea Patrol and Strike RPV, and recommendations.

In Volume II are presented the results of four specific studies of the application of NAVSTAR to Close Air Support, Sea Patrol, Interdiction Strike, and Strike RPV.

Volume IIC addresses the third of those specific studies and discusses some of the implications of fitting NAVSTAR to interdiction strike aircraft, the benefits that should arise and the results of an analytical performance study conducted to examine some of the system trade-offs involved.

The report consists of one main document (Vol.I) and four appendices published separately (Vol.IIA, B, C and D).

Conference Proceedings 292
October 1980
154 pages
ISBN 92-835-1370-3

Guidance and Control Aspects of Tactical Air-Launched Missiles

The proceedings include papers presented at a symposium of the Guidance and Control Panel held at Eglin Air Force Base, Florida, USA – 6/9 May 1980.

Twenty six papers were presented on the following topics:

- Operational requirements
- System considerations

– Air-to-surface guided weapons technology
– Air-to-air guided weapons technology
– Tactical guided weapons evaluation techniques.

Advisory Report 154
J.M.Gonzalez
October 1980
14 pages
ISBN 92-835-1372-X

Technical Evaluation Report on the 30th Guidance and Control Panel Technical Meeting: Symposium on Guidance and Control Aspects of Tactical Air-Launched Missiles
The GCP Symposium was held at Eglin Air Force Base, Florida, USA, 6–9 May 1980. The programme as presented at the Symposium is appended to this report. The complete compilation of papers has been published as Conference Proceedings CP-292.

Conference Proceedings 292
(Supplement)
(Classified)
October 1980
150 pages

Guidance and Control Aspects of Tactical Air Launched Missiles
The publication is a classified supplement to AGARD Conference Proceedings No.292 of a symposium of the Guidance and Control Panel held at Eglin Air Force Base, Florida, USA – 6/9 May 1980.

Twenty six papers were presented on the following topics:
– Optimal requirements
– System considerations
– Air-to-surface guided weapons technology
– Air-to-air guided weapons technology
– Tactical guided weapons evaluation techniques

AGARDograph 255
W.M.Hollister (Editor)
October 1980
226 pages
ISBN 92-835-1371-1

Advancement on Visualization Techniques
Despite the rapid growth in the field of visualization and display in aircraft cockpits, there is no current textbook which describes the technology and those basic principles which provide a foundation for someone interested in this subject. The purpose of the AGARDograph is to provide some of the basic principles and at the same time report on recent developments which contribute to the state-of-the-art. The subject matter is focused broadly on principles, technology, and applications. It is hoped that it will be of value to both the expert in the field as well as the newcomer who wishes to find out what cockpit displays are all about.

PROPULSION AND ENERGETICS PANEL (PEP)

Advisory Report 150
(French and English)
M.L.Barrere
February 1980
50 pages
ISBN 92-835-0259-0

Turbulent Transport Phenomena – Les Phénomènes de Transport Turbulent
In 1976, the Propulsion and Energetics Panel set up its Working Group 09 on 'Turbulent Transport Phenomena'. The objective was to improve knowledge of scalar fluctuation in turbulence with or without chemical reaction in variable density flows and to develop techniques for measurement of scalar fluctuations, especially static pressure.

This report contains the results of the Working Group. After the description and the discussion of the temperature measurement methods (optically and using probes) the measurement methods of non constant concentration and density are treated. After regarding the possibilities of fluctuating pressure measurement some conclusions are drawn.

En 1976, le Panel Energétique et Propulsion créa le Groupe d'Etudes 09 sur 'Les Phénomènes de Transport Turbulent'. Ce Groupe avait pour objectif l'amélioration des connaissances sur les fluctuations scalaires de la turbulence avec ou sans réaction chimique dans les écoulements à densité variable et la mise au point de techniques de mesure de fluctuations scalaires, en particulier de pression statique.

Ce rapport contient les résultats des activités de ce Groupe d'Etudes. Après une description et un examen des méthodes de mesures de températures (à l'aide de dispositifs optiques et de sondes), sont étudiées les méthodes de mesure de concentration et de densité non constante. Un tour d'horizon des possibilités de mesures de pression fluctuante est suivi de la présentation de certaines conclusions.

Conference Proceedings 274
February 1980
236 pages
ISBN 92-835-0258-2

Advanced Control Systems for Aircraft Powerplants
These Conference Proceedings contain the 19 papers presented at the AGARD Propulsion and Energetics Panel 54th(A) Specialists' Meeting on 'Advanced Control Systems for Aircraft Powerplants' which was held in Cologne, Germany on 1–2 October 1979. The questions and answers after the presentation of each paper as well as the Round Table Discussion at the end of the meeting are included.

The Meeting was in five sessions: Development Experience, Control Implementation, Optimum Control Strategies, Digital Control Concepts, and the Round Table Discussion.

The meeting was focussed on current and projected developments in control systems for aircraft powerplants. The application of digital control technology on aircraft turbine engines was especially emphasized. The meeting served as a platform for discussion and exchange between research scientists, development specialists and applicants of control systems.

Whether the meeting achieved its initial aim of furnishing a comprehensive control system technology survey will be assessed in a Technical Evaluation Report to be published as AGARD Advisory Report AR 152.

Conference Proceedings 275
February 1980
392 pages
ISBN 92-835-0260-4

Combustor Modelling

These Conference Proceedings contain the 24 papers presented at the AGARD Propulsion and Energetics Panel 54th(B) Specialists' Meeting on 'Combustor Modelling' which was held in Cologne, Germany, on 3–5 October 1979. The questions and answers after the presentation of each paper are included.

The Specialists' Meeting was organized into five sessions: Survey (2 papers); Basic Phenomena (11 papers which were presented in two parts); Transient Phenomena and Instabilities (2 papers); Furnaces and Boilers (5 papers); and Gas Turbine Combustors and R/H Systems (4 papers).

The meeting provided a forum during which the different models and methods used in turbine engine research and development could be compared. Even models used in non-aerodynamical circles were discussed.

The aim of the meeting was to provide research scientists with knowledge on realistic types of combustor models and on experimental conditions under which the theoretical models are valid for practice, and to assist manufacturing engineers in the selection of adequate theoretical models. Whether the meeting achieved the aim will be assessed in a Technical Evaluation Report, to be published as AGARD Advisory Report AR-153.

Advisory Report 152
J.D.Powell
March 1980
9 pages
ISBN 92-835-1353-3

Technical Evaluation Report on the Propulsion and Energetics Panel 54th(A) Meeting *on Advanced Control Systems for Aircraft Powerplants*

This Technical Evaluation Report on the Propulsion and Energetics 54th(A) Specialists' Meeting on Advanced Control Systems for Aircraft Powerplants contains a survey on the nineteen papers presented, and of the discussions which followed each paper, as well as of the concluding Round Table Session. Conclusions are drawn.

The papers presented at the meeting together with the discussions are published as AGARD Conference Proceedings No.274 – Advanced Control Systems for Aircraft Powerplants.

Advisory Report 153
D.Dryburgh and R.B.Edelman
March 1980
18 pages
ISBN 92-835-1355-X

Technical Evaluation Report on the Propulsion and Energetics Panel 54th(B) Meeting on Combustor Modelling

The task of this report is to evaluate the AGARD Propulsion and Energetics Panel 54th(B) Specialists' Meeting on Combustor Modelling, which was held at DFVLR, Cologne, Germany, from 3 to 5 October 1979. After a short introduction, the meeting papers are classified into a lot of categories concerning model elements, dimensionality, survey type, application and theoretical development. The first evaluation follows this classification, while other evaluations are related to the manufacturer's and the researcher's point of view. The report is finalized with conclusions and recommendations for future treatment of combustor modelling.

The full papers of the Proceedings are published as AGARD Conference Proceedings No.275.

Conference Preprint 281
April 1980
162 pages

Testing and Measurement Techniques in Heat Transfer and Combustion
Preprints of papers delivered at Meeting in Brussels, May 1980.

Conference Preprint 282
April 1980
242 pages

Centrifugal Compressors, Flow Phenomena and Performance
Preprints of papers delivered at Meeting in Brussels, May 1980.

Conference Proceedings 281
September 1980
292 pages
ISBN 92-835-0272-8

Testing and Measurement Techniques in Heat Transfer and Combustion

These Conference Proceedings contain the 22 papers presented at the AGARD Propulsion and Energetics 55th(A) Specialists' Meeting on Testing and Measurement Techniqes in Heat Transfer and Combustion, which was held in Brussels, Belgium, on 5–7 May 1980. The questions and answers after the presentation of each paper are included.

The Technical Evaluation Report is included at the beginning of the Conference Proceedings.

The meeting consisted of five sessions: Engine Related Measuring Techniques; Heat Transfer for Measurement Techniques; Optical Velocity Measurement Techniques in Flames; Optical Techniques for Temperature and Composition Measurements (Parts I and II).

The meeting was intended to be a complement to the recent PEP meetings on 'High Temperature Problems in Gas Turbine Engines', and on 'Combustor Modelling'. Emphasis was placed on experimental techniques relevant to both of these areas. Recent advances in temperature measurements, flow measurements, composition and chemical measurements, and in general techniques, were discussed.

The aim of the meeting was to furnish a comprehensive survey of modern test rigs and measurement techniques to development engineers for combustors and other high temperature components; to provide research scientists in these areas with new techniques developed during recent years; and to provide a platform for discussing and comparing the different techniques.

Conference Preprint 293
September 1980
246 pages

Turbine Engine Testing
Preprints of papers delivered at Meeting in Turin, September/October 1980.

Conference Proceedings 282
November 1980
352 pages
ISBN 92-835-0271-X

Centrifugal Compressors, Flow Phenomena and Performance
These Conference Proceedings contain the 21 papers presented at the AGARD Propulsion and Energetics Panel 55th(B) Specialists' Meeting on Centrifugal Compressors, Flow Phenomena and Performance, which was held in Brussels, Belgium, on 7- 9 May 1980. The questions and answers after the presentation of each paper, as well as after the evaluation which was made at the end of the meeting, are included.

The Technical Evaluation Report is included at the beginning of the Conference Proceedings.

The meeting was divided into five sessions: Experimental Investigations on Flows in Impellers and Diffusers; Theoretical Calculations of Flows in Impellers; Interaction between Impeller and Diffuser; Design Experience and Performance of Advanced Centrifugal Compressors (Parts I and II).

The papers were focussed on the inducer, impeller and the diffuser flow field, on interaction between impeller and diffuser, and they provided a comprehensive survey and detailed information on design experience and centrifugal compressor performance. *Viscous transonic, compressible and 3-D effects were studied.* The influence of non-uniform flow at the rotor outlet on performance and surge margin, namely for high pressure ratio compressors, were discussed.

STRUCTURES AND MATERIALS PANEL (SMP)

Report 673
N.Lambourne, R.Destuynder, K.Kienappel and R.Roos
February 1980
48 pages
ISBN 92-835-1346-0

Comparative Measurements in Four European Wind Tunnels of the Unsteady Pressures on an Oscillating Model (the NORA Experiments)
The European GARTEUR organization initiated, a few years ago, a cooperative programme on the effects of the walls of a wind tunnel on the behaviour of dynamic models used for flutter certification of aircraft. Tests have been completed by the same team, on the same model, in four European wind tunnels and the results, collected in the same form, have been thoroughly analayzed. The report describes the experiments and presents the most important results and practical conclusions.

Report 683
R.F.O'Connell
February 1980
20 pages
ISBN 92-835-1348-7

Design, Development and Implementation of an Active Control System for Load Alleviation for a Commercial Transport Airplane
The first application of the concept of manoeuvre load reduction to a large civil aircraft, is the system developed by Lockheed for the L-1011. In particular, certification problems had to be addressed, with the many new aspects introduced by the active control technology. The report should help the understanding of the possibilities and the difficulties that appear in dealing with large practical applications.

Conference Proceedings 276
March 1980
364 pages
ISBN 92-835-0261-2

Ceramics for Turbine Engine Applications
To provide a basis from which an evaluation of the "state-of-the-art" could be derived, and a forum to stimulate future progress, the Structures and Materials Panel and the Propulsion and Energetics Panel of AGARD cooperated to organize and conduct a

multinational, multidisciplinary Specialists' Meeting on "Ceramics for Turbine Engine Applications" which was held in Cologne, Germany on October 8–10, 1979. Twenty three papers during two very full days presented progress in materials, design and production technologies, the results of component test programs, and analyses of potentially profitable applications for ceramics and the requirements that these generate. They were supplemented by extensive discussion and a half-day round table designed to stimulate interaction between materials scientists, materials engineers, manufacturing engineers and engine designers, and to illuminate important issues.

Report 685
March 1980
36 pages
ISBN 92-835-1354-1

Aircraft Dynamic Response to Damaged Runways

The three papers included in this Report were presented as the first stage of a study of the potential problems of aircraft dynamic response to damaged and repaired runways, and arrived at the following general conclusions. For small aircraft with relatively simple landing gear, the operation over nominal repairs was dominated by rigid body motions of the aircraft. The prediction of those motions was possible and compared reasonably well with experimental data. For larger aircraft or aircraft with large external stores, the prediction of detailed loads in critical areas has met with limited success so far. Since landing gear equations are highly nonlinear, the prediction of aircraft dynamic response has required time-consuming numerical integrations. Also, the behaviour of large external stores can be affected by nonlinear effects (such as rigging loads), and both landing gear and external stores nonlinearities are affected by aircraft servicing procedures and by the ambient environment.

AGARDograph 257
H.Liebowitz (Editor)
May 1980
434 pages
ISBN 92-835-1359-2

Practical Applications of Fracture Mechanics

The publication has essentially been oriented to present practical applications of fracture mechanics to all aspects of aircraft design, manufacutre and testing. Although theoretical discussions are included to provide an appreciation of the complexity of the problems involved, the emphasis is on practical examples. Applications to engine components; built-up structures; joints, lugs and fasteners; integral structures and forgings are covered. The effects of stress corrosion and problems of scatter affecting determination of stress concentration factors, fatigue crack propagation and residual strength are discussed.

Report 676
May 1980
50 pages
ISBN 92-835-1358-4

Requirements, Design and Development of Large Space Antenna Structures

The use of telecommunications spacecraft is expected to see a tremendous increase during the next decade. At the radio frequencies most likely to be commonly used, elastic deformation and thermal distortion can have significant effects on the accuracy and efficiency of the antennas. The Structures and Materials Panel of AGARD is therefore proposing to hold a future Specialists' Meeting on Dimensionally Stable Structures for Space to review structural and materials requirements for such antennas, and to discuss design and test methods and criteria. The three papers contained in this publication were presented at the Fall 1979 Meeting of the Panel as guidance in the planning of the forthcoming Specialists' Meeting.

Report 687
July 1980
38 pages
ISBN 92-835-1365-7

Mathematical Modeling of Linear and Non-Linear Aircraft Structures

This report comprises two papers presented to the Aeroelasticity Sub-Committee of the the Structures and Materials Panel in April 1980. One paper proposes adjustment algorithms for improving the theoretically obtained flexibility and mass distributions of an aircraft structure by dynamic or ground resonance tests. The other deals with the non-linear behaviour of wing-store configurations and its analytical representation. Conclusions are drawn on the excitation amplitudes at which flutter could occur.

Conference Proceedings 288
August 1980
338 pages
ISBN 92-835-0273-6

Effect of Service Environment on Composite Materials

This meeting consisted of 21 presentations divided into 5 sessions:
- Physico-Chemical Effects of Environment
- Environment Superimposed on Stressing
- Mechanical Effects and Hazards
- Physical Hazards (lightning, rain erosion . . .)
- Case Studies of Service Experience.

The effects of humidity and of impacts, particularly when tests were made in compression, were emphasized. Damage due to lightning appeared to be less serious than had previously been supposed.

Some theories were propounded for the calculation of erosion, for the prediction of properties in a vacuum and for fatigue damage.

Service experience, on the other hand, proves to be extremely favourable and has not shown, up until now, any evidence of disturbing phenomena.

Report 688
M.Couston, J.J.Angélini et J.P.Meurzec
août 1980
22 pages
ISBN 92-835-2107-2

Comparaison des Champs de Pression Instationnaires Calculés et Mesurés sur le Modèle ZKP
La connaissance des faces aérodynamiques instationnaires ou transsoniques devient de plus en plus nécessaire pour prévoir les riques de flottement et pour mettre au point les systèmes de contrôle actif. A partir de méthodes operationnelles sur profil, les auteurs proposent une méthode des tranches qui prend en compte les aspects tridimensionnels d'une manière approchée. Une application est présentée pour l'aile supercritique ZKP.

Report 689
August 1980
56 pages
ISBN 92-835-0270-2

Report on a Cooperative Programme on Active Flutter Suppression
Presentations are given on the results of a cooperative programme on active flutter suppression on a dynamic model of the YF-17 aircraft. During this programme, British Aerospace, *MBB*, *Northrop*, *Air Force Flight Dynamics* Laboratory, NASA and ONERA cooperated in deriving control laws for active flutter suppresion for one explosive wing-store flutter case of the model. Phase control laws were all tested and compared during wind tunnel tests performed in the Langley 16 ft wind tunnel in October 1979. Results were quite promising and open the way for future cooperation on full-scale aircraft.

Report 678
T.Coombe and R.B.Urzi
November 1980
60 pages
ISBN 92-835-1375-4

Critically Loaded Hole Technology – Pilot Collaborative Test Programme. Final Technical Report
This report contains the results of a pilot cooperative experimental programme which investigated the interaction of fastener hole quality and resulting fatigue lives of low load transfer structural joints when subsequently utilizing fatigue rated and non-fatigue rated fastener systems. These fastener systems were primarily loaded in shear.

A load level verification was made and it was established that there were few differences, within the range of testing frequencies used in this pilot programme, in the accuracy of loading or comparability of data between participants.

Highlights of the data indicated that interference fit fasteners may be relatively insensitive to effects of surface finish and hole quality with the exception of dimensional tolerance which is important because it affects interference fit. Interference fit fasteners gave better results than clearance fit.

TECHNICAL INFORMATION PANEL (TIP)

Conference Proceedings 279
April 1980
106 pages
ISBN 92-835-0264-7

International Access to Aerospace Information
These Proceedings concern an AGARD Technical Information Panel meeting held in Athens and are prefaced by a review of the status of Greek organization, facilities etc. with respect to access to aerospace information. The review is then widened to consider the state of European co-operation in the field and the nature of NASA's important contribution. Later papers deal with requirements and tools for international co-operation and data exchange; problems in the utilization of aerospace literature; and non-literature data in aerospace R&D. Transcripts of the discussions of the various papers and of a closing round-table discussion are included.

Index 77/79
August 1980
432 pages
ISBN 92-835-1369-X

AGARD Index of Publications 1977–1979
This book, which is the sixth in the current AGARD Index series, provides abstracts and indexes for AGARD publications published during the period 1977–1979. Full bibliographic citations and abstracts are included, and the listing is indexed by Subject (based on NASA Thesaurus nomenclature), Personal Author, Corporate Source, Report/Accession Number, and Accession/Report Number.

AGARDograph 235
Volume III
S.C.Schuler (General Editor)
October 1980
192 pages
ISBN 92-835-1373-8

Manual of Documentation Practices Applicable to Defence-Aerospace Scientific and Technical Information – Volume III, Information Retrieval, Dissemination Practices, Microform Systems and Reprography
The third of four separately published volumes describing the basic documentation practices involved in the initial setting up and operation of an Information-Library organisation to provide defence-aerospace information services. The focus is on a practical, rather than theoretical, approach for both the senior person setting up a new system as well as junior staff, who may be using the manual as a training aid.

This volume consists of three main sections. The first section describes aspects of information retrieval and includes the principles of post co-ordinate indexing and examples of feature and edge punched card systems; the use of computers to produce various types of indexes and the role of 'dial up' on-line systems. In the second

section, information dissemination practices are outlined and a survey of procedures used by a number of international technical information centres is given. Section three describes the preparation and reproduction of R & D publications in both paper and microform media. The factors involved in setting up production facilities are discussed.

Publication of Volume IV is scheduled for 1981.

Conference Preprint 294
October 1980
68 pages

ISBN 92-835-0166-7

Information Services: Their Organization, Control and Use
Preprints of papers delivered at Meeting in Lisbon, November 1980.

Multilingual Aeronautical Dictionary
The new AGARD Multilingual Aeronautical Dictionary contains about 7,300 scientific, technical and engineering aeronautical terms, alphabeticized in English. Each term is accompanied by an English definition (5-100 words in length and incorporating the latest technological developments) and by translations of the term into: German, Spanish, French, Greek, Italian, Dutch, Portuguese, Russian, and Turkish.

In addition, the Dictionary includes a list of aeronautical acronyms and abbreviations, together with nine alphabetical-order lists of terms – one for each language other than English. Each term is accompanied by a reference number which is keyed to its English-language equivalent in the main body of the book. From these reference numbers, equivalents in the nine other languages, and definitions in English, can readily be found.

LECTURE SERIES

Lecture Series 104
November 1979
372 pages
ISBN 92-835-1340-1

Parameter Identification
The aim of this Lecture Series is to review the present state of the art of Aircraft Parameter Identification Techniques and to provide a critical appraisal of current methods developed and applied to the problems of Analysis of Flight Test Data in a number of NATO countries. Particular emphasis is placed on the practical aspects of Aircraft Parameter Estimation to generate information useful for the Flight Test Engineer.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Flight Mechanics Panel and the Consultant and Exchange Programme of AGARD presented on 29–30 October 1979 at Delft in The Netherlands and 1–2 November 1979 in London, UK.

Lecture Series 106
March 1980
192 pages
ISBN 92-835-1357-6

Materials Coating Techniques
This AGARD Lecture Series No.106 is sponsored by the Structures and Materials Panel of AGARD and is implemented by the Consultant and Exchange Programme.

In recent years, many new coating techniques have been coming into use, or are being developed, for applications where increased protection of engineering materials from the effects of corrosion, erosion and wear, particularly at high temperatures, is needed. This Lecture Series will be introduced with a review of the principles and the present state-of-the-art of applying metallic, ceramic and organic layers for these purposes, with particular emphasis on new techniques such as plasma spray, ion beam, laser etc. The resultant structure and properties of the coating layers and their interaction with the bulk material will be considered.

Lectures will also cover the behaviour of coated parts, as determined by the coating technique and material, and the effects in service of such aspects as corrosion, fatigue, tribology problems, structural stability etc. Finally, available techniques for the analysis and non-destructive evaluation of the composition, properties and soundness of the layers will be assessed.

The material in this publication was assembled in support of a Lecture Series and presented on 27–28 March 1980 in Lisbon, Portugal; on 31 March–1st April 1980 in Athens, Greece and on 3–4 April 1980 in Ankara, Turkey.

Lecture Series 107
May 1980
172 pages
ISBN 92-835-0265-5

The Application of Design to Cost and Life Cycle Cost to Aircraft Engines
The Lecture Series No.107 is sponsored by the Propulsion and Energetics Panel of AGARD and implemented by the Consultant and Exchange Programme.

All of the NATO nations are faced with a major concern for the growing cost of

defence and the need to ensure that cost and performance are optimized. The requirements and related costs of weapon systems have come under close examination. The entire life cycle of a weapon system and its subsystems must be examined. The cost of design and development must now include not only the cost of production but also deployment, training, operational use, and support. The use of new technology and new management techniques are essential to obtaining the most for the available money.

The purpose of this Lecture Series is to examine the latest methodologies of cost/performance comparison and trade-offs for aircraft engines. Information will include data collection, analysis, modelling and estimating all development and operations costs. Also addressed will be contractual provisions and the costs related to incentives for performance and reliability. The latest application in both government and industry will be covered, with examples and experiences from the military and civilian sectors.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Propulsion and Energetics Panel and the Consultant and Exchange Programme of AGARD, presented on: 12–13 May 1980, Saint Louis, France; 15–16 May 1980, London, UK.

Lecture Series 108
May 1980
202 pages
ISBN 92-835-0266-3

Aircraft Assessment and Acceptance Testing

The Lecture Series reviews the present state of the art of aircraft assessment and acceptance testing of production aircraft. This particular kind of testing is needed to select, from a variety of offers, the best aircraft type for a mission and to check that any aircraft on the production line is identical to the type, with acceptable tolerances.

Emphasis is placed on the practical aspects of this technique in order to help the flight crews and organisations dealing with this activity. Flight test instrumentation methods are set forth that do not require the use of sophisticated ground and airborne instrumentation for data acquisition or large computers for data processing. Flight test techniques described illustrate ways to acquire acceptable results utilizing a minimum of instrumentation or no instrumentation.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Flight Mechanics Panel and the Consultant and Exchange Programme of AGARD, presented on 5–6 June 1980 in Gøl, Norway, 9–10 June 1980 Athens, Greece and 12–13 June 1980 Ankara, Turkey.

Lecture Series 110
May 1980
236 pages
ISBN 92-835-1361-4

Atmospheric Electricity –Aircraft Interaction

The potential susceptibility of aircraft to atmospheric electricity hazards (such as lightning and static charging phenomena) appears as an increasing threat to future aircraft for two reasons: on the one hand, more and more sensitive solid-state electronics and microprocessors will be used in the future on flight critical equipment, as can be anticipated from advanced guidance and control hardware developments: on the other hand, new structural materials, such as dielectrics and composites, will be extensively used for aircraft, leading to potential problems due to surface charges and reducing the electromagnetic shielding protection offered by the conventional metallic skins on present-day vehicles.

Starting with fundamentals of atmospheric electricity phenomena, the Lecture Series reviews the hazards, criteria, testing and avionics protection, and provides insights from both pilot and design perspectives. In view of the above, this Lecture Series should be of interest to aircraft manufacturers, airline operators, government and industrial research establishments, and avionics engineers.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Avionics Panel and the Consultant and Exchange Programme of AGARD, presented on 9–10 June 1980 in London, UK; 12–13 June 1980 Munich, Germany and 24–25 June 1980 Menlo Park, California, USA.

Lecture Series 111
July 1980
280 pages
ISBN 92-835-1360-6

Cryogenic Wind Tunnels

For aeronautical research the advantages of the cryogenic wind tunnel lie mainly in the practical attainment of full scale values of Reynolds number, and in the case of pressurized cryogenic tunnels the means to separate Mach and Reynolds number effects from aeroelastic effects.

This Lecture Series is designed for engineers, including those experienced with conventional wind tunnels, wishing to acquire in a concentrated form the principles and practice of cryogenic wind tunnels. The emphasis is on the unfamiliar facets of technology which must be applied, and on solutions to special problems which arise from the exploitation of a low temperature test gas. The Lectures provide up-to-date information on the aerodynamic and mechanical design of continuous and intermittent cryogenic wind tunnels and their models, and on techniques for controlling

test parameters. Design information includes properties of materials, the storage and handling of cryogenic liquids, insulation systems for pipelines and tunnel circuits, and safety requirements. Solutions are included for the special requirements of instrumentation systems for plant, tunnel and model. The physical processes are described which determine the lower limits of operating temperature.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Fluid Dynamics Panel, the Consultant and Exchange Programme of AGARD and the von Kármán Institute for Fluid Dynamics presented on: 19–23 May 1980 at the von Kármán Institute, Rhode-Saint-Genèse, Belgium and 27–30 May 1980 at NASA Langley Research Center, Virginia, USA.

Lecture Series 109
September 1980
182 pages
ISBN 92-835-0274-4

Fault Tolerance Design and Redundancy Management Techniques

These lectures are intended to provide the basic theory on concepts involved in the application of advanced software, state estimation, and implementation techniques involved in redundancy management, and to give a review covering the necessary background and state-of-the-art involved in the application of advancing technologies.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Guidance and Control Panel and the Consultant and Exchange Programme of AGARD, presented on: 13–14 October 1980 in Athens, Greece; 16–17 October 1980 in Rome, Italy and 20–21 October 1980 in London, UK.

Lecture Series 112
September 1980
148 pages
ISBN 92-835-0275-2

Patents – An Information Resource

Patents, an important part of the total spectrum of scientific and technical information, are often overlooked by the information community and the scientific and technical community. The purpose of this Lecture Series is to make these communities more aware of the importance of patents to the research, development and engineering efforts in each country. The focus of the lecture series will be first on the wide range of applications for information from patents and second on the methods that can be used for acquiring that information. Methods used for indexing and classifying will be discussed, the various available abstracting services will be compared and techniques for searching, including automated systems, will be described. Participants, thus having a better understanding and appreciation of the bibliographic methods that are used for the control of patent literature, will be in a better position to use this valuable information resource.

The material in this publication was assembled to support a Lecture Series under the sponsorship of the Technical Information Panel and the Consultant and Exchange Programme of AGARD.

MILITARY COMMITTEE STUDIES (MCS)

Advisory Report 160
(Classified)
March 1980
100 pages

Project 2000 Overview – Second Printing, with Editorial Revisions

This overview report summarises the results of the three studies conducted under AGARD Project 2000 and fits the findings into the broader perspectives of the NATO environment. The full reports of the three studies: "Attack of Surface Targets", "Defence Against Missiles" and "Detection, Location and Recognition of Ground Targets" are contained in AGARD Advisory Reports numbered 161, 162 and 163 respectively.

Concepts are developed for future military systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various sensor systems, delivery vehicles and weapon systems, as appropriate, to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis are identified and some of the technical and cost factors bearing on the applications of new technologies to system design are highlighted.

Advisory Report 161
Volume 1
(Classified)
March 1980
84 pages

Attack of Surface Targets – Summary Report. Second Printing, with Editorial Revisions

Concepts are developed for future surface target attack systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various weapons and delivery vehicles to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis in order to realize the preferred systems are listed.

This study is one of three conducted under AGARD Project 2000. The others,

"Defence Against Missiles" and "Detection, Location and Recognition of Ground Targets" are documented AGARD Advisory Reports 162 and 163 respectively. The Overview Report of the three studies is contained in AGARD AR 160.

Advisory Report 162
Volume 1
(Classified)
March 1980
50 pages

Defence Against Missiles – Summary Report. Second Printing, with Editorial Revisions
Concepts are developed for future missile defence systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various weapons and delivery vehicles to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis in order to realize the preferred systems are listed.

This study is one of three conducted under AGARD Project 2000. The others, "Attack of Surface Targets" and "Detection, Location and Recognition of Ground Targets" are documented AGARD Advisory Reports 161 and 163 respectively. The Overview Report of the three studies is contained in AGARD AR 160.

Advisory Report 163
Volume 1
(Classified)
March 1980
78 pages

Detection, Location and Recognition of Ground Targets – Summary Report. Second Printing with Editorial Revisions
Concepts are developed for future ground target detection, location and recognition systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various sensors and platforms to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis in order to realize the preferred systems are listed.

This study is one of three conducted under AGARD Project 2000. The others "Attack of Surface Targets" and "Defence Against Missiles" are documented AGARD Advisory Reports 161 and 162 respectively. The Overview Report of the three studies is contained in AGARD AR 160.

Advisory Report 120
Volume 2
(Classified)
April 1980
268 pages

Communications Devices Supporting Air Warfare with Reduced Susceptibility to Jamming, Intercept, and Location Determination – Main Report & Appendices
Most communications systems supporting aerospace operation are susceptible to jamming, intercept, and direction finding. Jamming would make combat operations extremely difficult without effective counter-countermeasures (CCM). This Study investigates various measures available to reduce the susceptibility to the threat.

The study considers the following topics: Communication Requirements Supporting Air Warfare Activities; Equipment and Systems Description; Electronic Warfare Considerations, Parametric Identification of System Susceptibility to Intercept, Location Determination, and Jamming, System Concept Analysis, Parametric Estimate of Trend and Cost-Effectiveness; Promising Areas for Future Research and Development.

The Study was conducted in response to a request from the North Atlantic Military Committee, under the management of the Aerospace Applications Studies Committee, Dr J.Dathe, Chairman.

Advisory Report 162
Volume 2
(Classified)
June 1980
202 pages

Defence Against Missiles – Main Report
Concepts are developed for future missile defence systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various weapons and delivery vehicles to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis in order to realize the preferred systems are listed.

This study is one of three conducted under AGARD Project 2000. The others "Attack of Surface Targets" and "Detection, Location and Recognition of Ground Targets" are documented AGARD Advisory Reports 161 and 163 respectively. The Overview Report of the three studies is contained in AGARD AR 160.

Advisory Report 103
Volume 3
(Classified)
June 1980
48 pages

AASC Study No.9: Advanced Technology to Counter the Low Altitude Threat (Other than Aircraft Mounted Radar) – Technical Reports on proposed Defence Systems
The first section presents three existing Man Portable Air Defence Systems (MANPADS) candidates, outlining in an Appendix their performance boundaries. Those three systems must be considered as possible and available examples of high performing Short Range Air Defence Systems. Nevertheless, as mentioned in this section, the guidance and control section, warhead fuze section or even the flight and launch motors could also be components from NATO or other short range

MANPADS. This section also introduces four inflight cooperative or non cooperative IFF concepts which have potential for implementing an in-flight abort of a missile.

The second section presents a digest of mainly archival material relating to the balloon barrages employed between 1914 and 1945. The object of this section is to provide a background of historical information on the problems experienced, and to expose the unresolved difficulties which may be relevant in any debate on the possible future application of balloon barrages.

Advisory Report 161
Volume 2
(Classified)
July 1980
242 pages

Attack of Surface Targets – Main Report
Concepts are developed for future surface target attack systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various weapons and delivery vehicles to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis in order to realise the preferred systems are listed.

This study is one of three conducted under AGARD Project 2000. The others, "Defence Against Missiles" and "Detection, Location and Recognition of Ground Targets" are documented AGARD Advisory Reports 162 and 163 respectively. The Overview Report of the three studies is contained in AGARD AR 160.

Advisory Report 163
Volume 2
(Classified)
August 1980
310 pages

Detection, Location and Recognition of Ground Targets – Main Report
Concepts are developed for future ground target detection, location and recognition systems that NATO might bring into being over the next two or three decades. For each of the system concepts an evaluation is made of the various sensors and platforms to identify the preferred approach in light of the expected threat, target characteristics, performance and potential cost. Technologies requiring specific emphasis in order to realise the preferred systems are listed.

This study is one of three conducted under AGARD Project 2000. The others, "Attack of Surface Targets" and "Defence Against Missiles" are documented AGARD Advisory Reports 161 and 162 respectively. The Overview Report of the three studies is contained in AGARD AR 160.

AGARD HEADQUARTERS (HQ)

Bulletin 80/1
February 1980
80 pages

Meetings – Publications – Membership
This issue of the AGARD Bulletin gave a schedule of meetings to be held in 1980, and a directory of AGARD members as of 1 January 1980.

Highlights 80/1

This booklet is one of a series aimed at establishing a more direct and informal means of communications between members of the AGARD community and their friends in the international aerospace profession. Items for publication are invited from all interested readers, and it is hoped that the Highlights will contain articles on the future activities of AGARD and provide a forum for the discussion of matters relating to AGARD's activities.

April 1980
88 pages

Director's Annual Report to the North Atlantic Military Committee 1979
This Report covers the AGARD 1979 Technical Programme. Achievements are reported in terms of: the meetings which were held to bring together the leading personalities of the NATO nations in a particular field of science and technology for the common benefit of the NATO Community; publications initiated for the purpose of assisting member nations in the effective use of their research and development capabilities; and the budget that supported this stimulus to the advances in the aerospace sciences relevant to strengthening the common defence posture.

June 1980
136 pages
December 1980
122 pages

AGARD Calendar of Selected Aeronautical and Space Meetings (July 1980–December 1981 issue and January 1981–June 1982 issue)
This document is published every six months, each issue covering the forthcoming 18-month period. As its title indicates, the Calendar contains details of a wide range of meetings, symposia, courses, etc., details of which were obtained from national and international organizations concerned with aeronautical and space subjects. For each entry is given the date, location, title and sponsor, keywords (indicating the main topics to be covered), and a contact code for enquiries. Distribution is limited to AGARD members only.

July 1980

AGARD Handbook (Revised)
This Handbook has been prepared primarily to serve as an introduction to AGARD. It is intended for three groups of readers. First, it should serve the interested scientists, engineers and members of the NATO Community at large who have come in contact with AGARD through one means or another and who would like to know more about what it is and how it works. Second, it is intended to be an introductory guide to newly-appointed members of AGARD, such as members of Panels, Committees, Working Groups and Staff. Third, this Handbook may prove to be useful to the present members of AGARD, who may like to have at hand a simple reference book to help describe AGARD to others, or to refresh their own memories on some points of procedure.

For these reasons, the treatment of the subject has been general rather than detailed in order to give a broad overall picture of AGARD. However, the By-Laws under which AGARD operates are included in the Handbook for specific detailed reference purposes.

Bulletin 80/2
August 1980
30 pages

This Bulletin reported the content and scope for the 1981 AGARD Technical Programme approved during the AGARD National Delegates Board Meeting, March 1980.

Highlights 80/2
September 1980
24 pages

See Highlights 80/1 above.

SECTION III

AGARD MEMBERSHIP LISTS

1 JANUARY 1981

- NATIONAL DELEGATES
- STEERING COMMITTEE MEMBERS
- NATIONAL COORDINATORS
- PANEL MEMBERS
- AEROSPACE APPLICATIONS STUDIES COMMITTEE MEMBERS
- AGARD STAFF

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MEMBERSHIP OF AGARD

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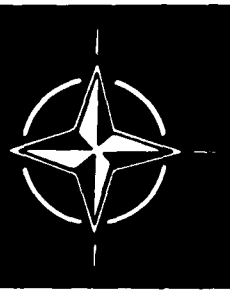

CALENDAR OF MEETINGS
1981

Dates	*Location*	*Activity*	*Type of Meeting/Subject*
2–5 March	UNITED STATES (NASA-Ames, Moffett Field)	Fluid Dynamics	Lecture Series No.114 **Dynamic Stability Parameters**
16–19 March	BELGIUM (VKI, Brussels)	Fluid Dynamics	Lecture Series No.114 **Dynamic Stability Parameters**
25–27 March	FRANCE (Paris)	Headquarters	50th **National Delegates Board Meeting** 30th **Panel Chairmen's Meeting** 11th **National Coordinators' Meeting** 30th **Steering Committee Meeting**
30 March–3 April	NETHERLANDS (Soesterberg)	Aerospace Medical	Specialists' Meeting on **Aural Communication in Aviation**
5–10 April	TURKEY (Çeşme)	Structures & Materials	52nd Panel Meeting/Specialists' Meeting on **Aircraft Corrosion and Corrosion Fatigue**
6–10 April	UNITED STATES (Monterey, Cal.)	Electromagnetic Wave Propagation	Symposium on **Special Topics in Optical Propagation** (NATO-Secret)
6–10 April	FRANCE (Paris)	Flight Mechanics	58th Panel Meeting/Symposium on **The Impact of Military Applications on Rotorcraft and V/STOL Aircraft Design** (NATO-Secret)
2–3 April	UNITED KINGDOM (London)	Propulsion & Energetics	Lecture Series No.113 **Microcomputer Applications in Power and Propulsion Systems**
6–7 April	GERMANY (Munich)	Propulsion & Energetics	Lecture Series No.113 **Microcomputer Applications in Power and Propulsion Systems**
9–10 April	ITALY (Genoa)	Propulsion & Energetics	Lecture Series No.113 **Microcomputer Applications in Power and Propulsion Systems**
4–8 May	GERMANY (Stuttgart)	Guidance & Control	32nd Panel Meeting/Symposium on **The Impact of New Guidance and Control Systems on Military Aircraft Cockpit Design** (NATO-Confidential)
11–15 May 18–20 May	UNITED KINGDON (London)	Military Committee Studies	AAS 13 & 14 Meetings 20th Meeting of the AASC – **Final Review of AAS 13** – **Initial Review of AAS 14** – **Final Terms of Reference for AAS 15 & 16** – **Organization of Study Group 15** (NATO-Secret)
11–15 May	FRANCE (Toulouse)	Fluid Dynamics	48th Panel Meeting/Symposium on **Aerodynamics of Power Plant Installation** (with participation of PEP)
11–15 May	FRANCE (Toulouse)	Propulsion & Energetics	57th Panel Meeting/Specialists' Meeting on **Helicopter Propulsion Systems**
22–23 June	FRANCE (Paris)	Aerospace Medical	Lecture Series No.115 **Personal Visual Aids for Aircrew**
25–26 June	GERMANY (Fürstenfeldbruck)	Aerospace Medical	Lecture Series No.115 **Personal Visual Aids for Aircrew**
22–26 June	NORWAY (Røros)	Avionics	41st Panel Meeting/Symposium on **Tactical Airborne Distributed Computing and Networks**
31 August – 1 September	NORWAY (Bölkesjo)	Avionics	Lecture Series No.116 **Electromagnetic Compatibility**
3–4 September	GERMANY (Munich)	Avionics	Lecture Series No.116 **Electromagnetic Compatibility**

Dates	*Location*	*Activity*	*Type of Meeting/Subject*
7–8 September	ITALY (Rome)	Avionics	*Lecture Series No.116* **Electromagnetic Compatibility**
7–11 September	GERMANY (Munich)	Technical Information	34th Panel Meeting/Specialists' Meeting on **What Should Users Expect from Information Storage and Retrieval Systems of the 1980's?**
16–18 September	UNITED KINGDOM (Oxford)	Headquarters	51st **National Delegates Board Meeting** 17th **Annual Meeting** 31st **Panel Chairmen Meeting**
21–25 September	BELGIUM (Brussels)	Electromagnetic Wave Propagation	28th Panel Meeting/Symposium on **Medium, Long and Very Long Wave Propagation (at frequencies less than 3000 kHz)**
27 September–2 October	NETHERLANDS (Noordwijkerhout)	Structures & Materials	53rd Panel Meeting/Specialists' Meeting on **Maintenance in Service of High Temperature Parts and Dynamic Environmental Qualification Techniques**
1–2 October	NORWAY (Bölkesjo)	*Guidance & Control*	*Lecture Series No.117* **Multivariable Analysis and Design Techniques**
5–6 October	NETHERLANDS (Delft)	Guidance & Control	Lecture Series No.117 **Multivariable Analysis and Design Techniques**
8–9 October	TURKEY (Ankara)	Guidance & Control	Lecture Series No.117 **Multivariable Analysis and Design Techniques**
5–8 October	GERMANY (Furstenfeldbruck)	Aerospace Medical	38th Panel Business Meeting
5–9 October	ITALY (Florence)	Flight Mechanics	59th Panel Meeting/Symposium on **Combat Aircraft Manoeuvrability** (NATO-Confidential or Secret)
12–16 October	GREECE (Athens, Agios Andreas)	Guidance & Control	33rd Panel Meeting/Symposium on **Guidance and Control Technology for Highly Integrated Systems** (NATO-Confidential)
19–23 October	GREECE (Athens, Agios Andreas)	Avionics	42nd Panel Meeting/Symposium on **Impact of Advanced Avionics Technology on Ground Attack Weapon Systems** (NATO-Secret)
19–20 October	DENMARK (Copenhagen)	Structures & Materials	*Lecture Series No.118* **Fatigue Testing Methodology**
22–23 October	PORTUGAL (Lisbon)	Structures & Materials	Lecture Series No.118 **Fatigue Testing Methodology**
26–27 October	GREECE (Athens)	Structures & Materials	Lecture Series No.118 **Fatigue Testing Methodology**
26–30 October	UNITED KINGDOM (London)	Propulsion & Energetics	58th Panel Meeting/Symposium on **Ramjets and Ramrockets for Military Application** (NATO-Confidential)
2–6 November	PORTUGAL (Lisbon)	Fluid Dynamics	*49th Panel Meeting/Symposium on* **Fluid Dynamics of Jets with Applications to V/STOL**
9–13 November 16–18 November	UNITED STATES (Washington D.C.)	Military Committee Studies	AAS 14 & 15 Meetings 21st Meeting of the AASC - **Final Review of AAS 14** - ***Initial* Review of AAS 15** - **Consideration of Proposed AA Studies** - **Organization of Study Group 16** (NATO-Secret)

SPECIAL COURSES

11–22 May	NETHERLANDS (Delft)	Flight Mechanics	**Flight Test Instrumentation Course**
7–11 Dec	BELGIUM (VKI, Brussels)	Fluid Dynamics/ Structures & Materials	**Modern Data Analysis Techniques in Noise and Vibration Problems *with Particular* Emphasis on Aeroacoustic Applications**

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